TECHNOLOGY DEPT.

AMERICAN MACHINIST

NOVEMBER 25, 1943

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A Report on Women in Industry—Page 83

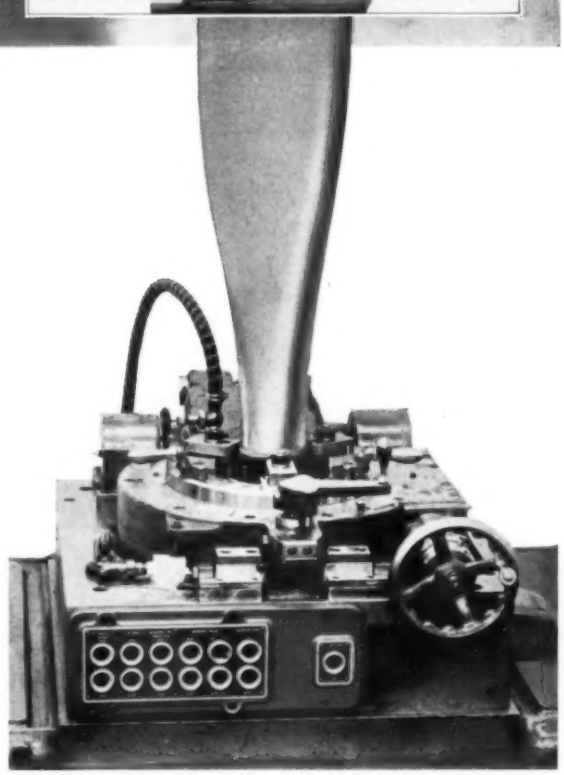
R v.87 pt.6 N-D '43

The propellers of a sharply climbing "Thunderbolt" bite off chunks of air — the way you bite into your favorite pie — in increasing amounts varied by pitch control from low pitch for take-off and climb to high pitch for maximum speeds. To change the "bite" or pitch of propeller blades they turn axially on bushings in the blade shanks — seats for which have to be true and accurate but difficult to produce.

These bushing seats are a tapered hole requiring accuracy to .0002" and taper to .00025" in 6 inches. Roundness and straightness have to be perfect for full bearing. Attempts to do the job by reaming and hand scraping proved unsatisfactory. New methods had to be found.

HEALD ENGINEERING solved the problem . . . solved it so satisfactorily that propeller blade seats of uniformly high precision are now produced at 1700% greater production. Propeller blades are held vertically on the Heald Bore-Matic specifically designed for this job . . . the rotating single-tool boring quill moves upward and angularly from below to generate a perfectly true seat.

Have you a wartime problem or do you need assistance in postwar planning? If it involves precision finishing, HEALD ENGINEERING is available, now, to help you.



As shown above the propeller blade is held stationary in a vertical position and the 3.2500" diam. 6" deep taper seat is generated from underneath by an angularly rotating boring bar. The fixture member is pivoted at the rear and is raisable, thus giving access for checking the bored hole as well as access to the boring bar.

The HEALD Machine Co., Worcester, Mass.

For More Precision Faster, bring your problems to Heald

Tech

TECHNOLOGY DEPT.

American Machinist

November 25, 1943

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RETURN POSTAGE GUARANTEED

VOLUME 87 NUMBER 24

AMERICAN MACHINIST. Copyright 1943 by McGraw-Hill Publishing Co., Inc. Published every other Thursday, price 35c a copy. Allow ten days for change of address. Subscription rates—United States, Mexico and Central and South American countries, $5 a year, $8 for two years, $10 for three years. Canada, $5.50 a year, $9 for two years, $11 for three years. All other countries $8 a year, $13 for two years, $16 for three years. Entered as second class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Cable address, "McGrawhill, New York." Member of A.B.P. Member of A.B.C.

A McGRAW-HILL PUBLICATION

PRINTED IN U. S. A.

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AMERICAN MACHINIST —chips

66 Candles . . . Since in the previous issue we commented on Ferracute Machine Company's 80th anniversary, we would like to touch briefly on the fact that November is the birth-month of *American Machinist* itself. Glancing through the very first issue—dated 1877—we ran across an "introductory" statement written in the style of those times. Excerpts follow:

"In this practical age progress is so rapid, that to give credence to new ideas and improvements as they obtain, nearly every large class of business has its representative newspaper, or in some instances, two or three acknowledged representatives, each treating wholly on topics pertaining to its specialty. There are many journals that claim recognition as exponents of machinery matters, but not one that confines itself exclusively to this important field. Recognizing the want of a live, enterprising journal to represent the machinery interest as a distinct branch of industry, we present this, our first issue of the *American Machinist*.

"With the best facilities at our command, we propose to make this the standard machinery newspaper of America, and to this end shall direct all our efforts . . .

"The present seems peculiarly a fitting period to start out upon the territory of enterprise we have chosen, for indications are strong and positive that the fog which has for four long years enveloped the commercial progress of our country is about to lift—slowly it may be, but surely. Already light begins to dawn, and the full sunshine of business prosperity will show a development of American machinery such as the world has never before witnessed. The genius that has distanced the old world in useful mechanical inventions will brighten still more under influence of auspicious times, and rapid improvements will be wrought, the adaptions of which will leave far behind those who cling to old ways and processes . . ."

And now let's roll up our sleeves and tackle the 67th year—which should be a humdinger.

o

Big Business . . . *We understand that electronic production—at a rate of 4 billions annually—now exceeds the average automobile volume for the years preceding the war. Increased war demands for devices already in use by the military and development of new devices will require much more production in this line than the present rate.*

This gives some idea of what's happening in the world of that mighty mite, the electron.

o

Metal Show . . . Our sincere thanks to the many readers who dropped into our room at last month's Metal Show to say hello.

As those of you who attended know, the set-up was quite different than usual. Lacking was some of the glamour and excitement which normally attend a big auditorium crowded with open booths and machinery. However, exhibitors showed remarkable ingenuity in bringing to the three floors of Chicago's Palmer House a lot of extremely interesting material.

Opinion was somewhat divided as to the value of the new arrangement but everyone seemed to agree that those who marched along the winding corridors of the hotel were there on serious business . . . and we believe they got more than their money's worth.

If any one thing was outstanding about the Show, it seemed to us to be the great increase in induction heating exhibits. There's a process that has gone a long way and seems to be gathering up steam. Some 20,000 persons attended the Show . . . which we understand will be held next year in Cleveland's big auditorium. We'll be seeing you!

o

Precision . . . *A recent ad by Cincinnati Grinders, Inc., may have caught your eye. If not, we might explain that it was featuring their centerless grinding machine, and to our mind epitomized the progress being made toward precision workmanship.*

The ad showed the taper end of a glass condenser tube being ground. Glass, mind you, and a fragile thing like a tube, too. A most dramatic example of a trend toward precision that will revolutionize many departments in many Metal-Working plants.

o

Steel . . . Among the business and technical editors gathered to speak last month at the Boston Conference of Distribution was *American Machinist's* John Haydock. You may be interested in some of the highlights of his talk:

Discussing the "Post-War Needs for Steel and Other Materials," Jack pointed out that wartime experience with low triple-alloy compositions in place of high-alloy steels will prove valuable in post-war manufacture. Some of the new compositions are here to stay with perhaps some modifications as alloy shortages become less critical.

Large quantities of relatively cheap high-strength steels will become available to industry. The job of converting rolling mills (designed for strip and sheet) to heavy plate required large outlays for equipment, but the reconversion will not be nearly so costly or time-consuming.

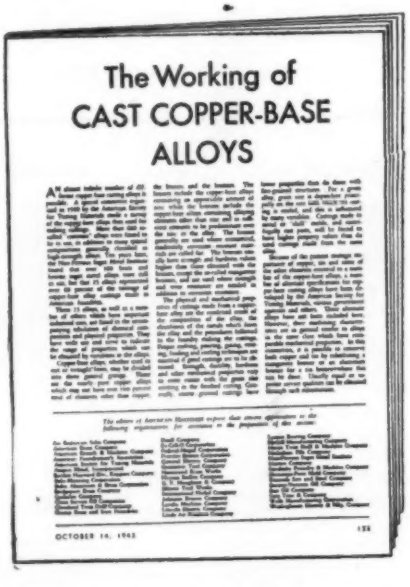
Jack also reported the estimate that a typical post-war year will see 8 million tons of steel going into the automobile industry and 2½ million into household appliances, hardware, furniture and office equipment. Other large users will be found in construction, agricultural implements, railroad equipment, oil, gas and mining equipment and other fields which cannot fully be satisfied under a war economy.

o

Blue Section . . . Close on the heels of the *American Machinist* special section on "The Working of Plastics" comes another timely one on "The Working of Cast Copper-Base Alloys."

A full 16 pages of valuable know-how, this section deals with coppers, brasses and bronzes in a variety of combinations. Classification and characteristics tables are given, together with condensed, meaty data on machining and finishing operations.

This is an important addition to the long list of Materials Sections brought to you by *American Machinist*. For reprints (at 15c each) write to *American Machinist*, 330 West 42 St., New York 18, N. Y.


The Working of
CAST COPPER-BASE
ALLOYS

MEMO

Don't Forget These Four Ways to Make Power "Turn a Corner"

There is a type of bevel or hypoid gear for every angular drive. Spiral bevel, straight bevel, Zerol bevel and Hypoid gears are all used over a wide range of sizes, loads, and speeds. Gleason Engineers will be pleased to assist you in designing the bevel gears for your particular application, and will specify the correct machines for their manufacture. Our 78 years' experience in making power "turn a corner" is at your service. Let us help you now.

SPIRAL BEVEL GEARS

curved, oblique, teeth--continuous tooth contact--localized tooth bearing--always several teeth in contact--quiet at high speeds and loads.

STRAIGHT BEVEL GEARS

simplest bevel gear type--radial teeth, tapering to cone center--low axial thrust operation--for speeds below 1000'/min. only.

ZEROL BEVEL GEARS

curved teeth with zero spiral angle-- low axial thrust operation --localized tooth bearing--cut on same Gleasons as spiral bevels and hypoids

HYPOID GEARS

Similar to spiral bevels, but with pinion axis offset --gear and pinion shafts can pass-- quiet, high speed, high load operation --cut on same Gleasons as spiral and Zerol bevels.

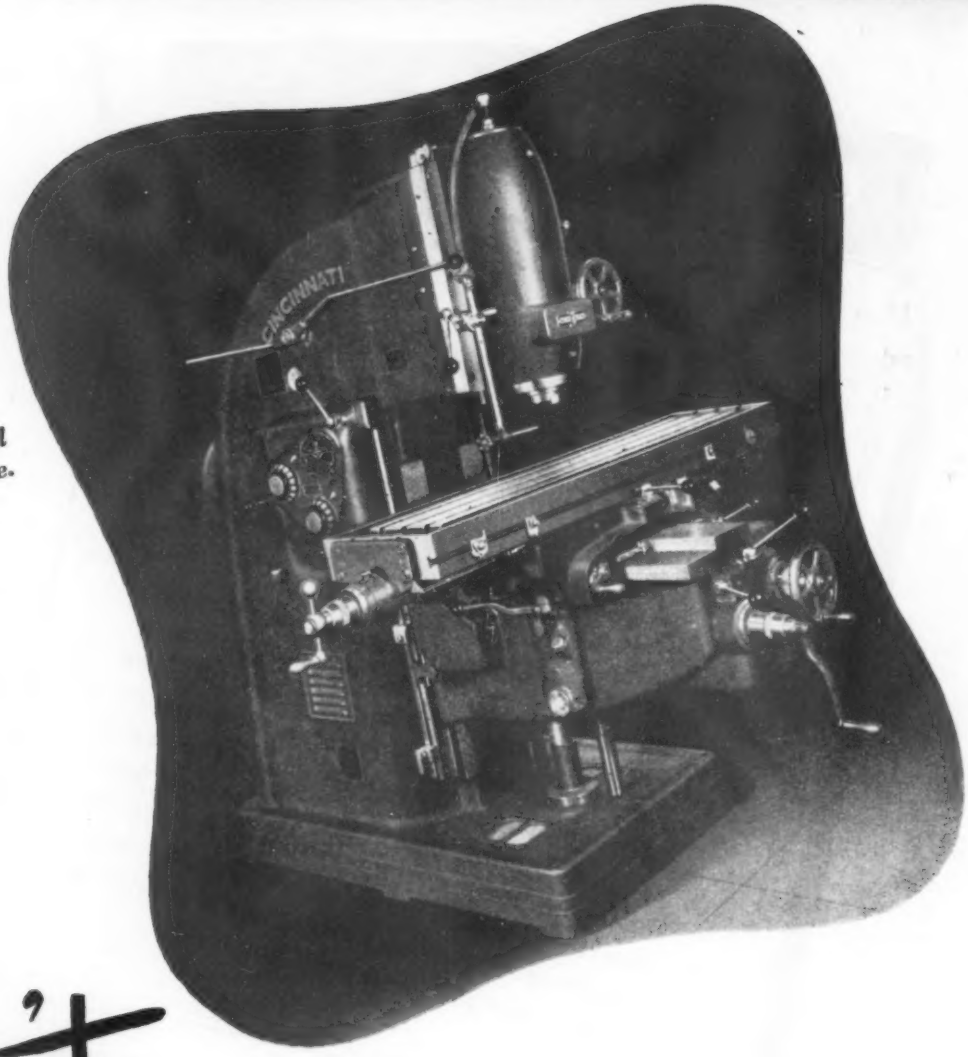
GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

ARMY E NAVY



CINCINNATI No. 3 Vertical Dial Type Milling Machine.

CINCINNATI

You can't beat a dial type FOR HANDLING A WIDE RANGE OF WORK

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

THE CINCINNATI

MILLING MACHINES

For general purpose milling, CINCINNATI Dial Types can't be surpassed. Basically sound design makes them exceedingly useful for milling a wide range of jobs. ¶ Just take a look at some of the features of these versatile millers: Power Speed and Feed Changes at Front and Rear Working Positions. High Spindle Speeds and Feeds. Power Feeds and Power Rapid Traverse — Longitudinal, Cross, Vertical. Duplicate set of Control Levers at Operator's Rear Working Position (Horizontal Machines). Touch-Control Starting and Stopping. Pull-Out, Quick-Adjusting Micrometer Dials. Automatic Motor Cut-Out Switch, and many others. ¶ Substantially built, expertly engineered, CINCINNATI Dial Types will give new-machine performance over long periods of time. The Dial Types are made in Plain, Universal and Vertical styles, Nos. 2, 3 and 4 sizes, medium and high speed ranges. For complete details, write for specification catalog M-970-2.

This operation consists of blending pockets in rear of hub into rear of spokes on aircraft propeller shaft. Machine has power feed and rapid traverse to the head and a four-position turret stop . . . convenient features for jobs like this, where it is necessary to vertically adjust the cutter to the work several times. Incidentally, the fixture was developed by engineers here at Milling Headquarters.

Milling the gripper edge of printing press cylinder. This operation requires a smooth finish and accurate limits, both of which are readily obtained on this No. 3 Vertical Dial Type Milling Machine.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

• BROACHING MACHINES • CUTTER SHARPENING MACHINES

IS THERE LIFE ON MARS?

IT is one of the most fascinating riddles of our time. For powerful telescopes have brought to light a strange network of "canals" on the planet's surface. . . Magnifying a celestial spark to the size of the moon, the power of light and a lens reveals facts never before suspected.

We have a parallel to make that is likewise interesting. It may be of importance to you.

We manufacture an industrial inspection instrument known as the **Jones & Lamson Optical Comparator**. It, too, consists primarily of light and a lens. Its purpose: rapid, accurate inspection.

Now this machine—by means of an enlarged shadow — reveals facts about the nature and the accuracy of parts that are often unobtainable by any other method of gaging. It makes possible the measurement and inspection of complex surfaces faster, more reliably and more *easily* than is possible with any other form of gage.

Because of this, **Jones & Lamson Optical Comparators** are in use today by leading producers in virtually every line of production . . . and the record of these machines in helping to cut costs and speed production is the important part of the story.

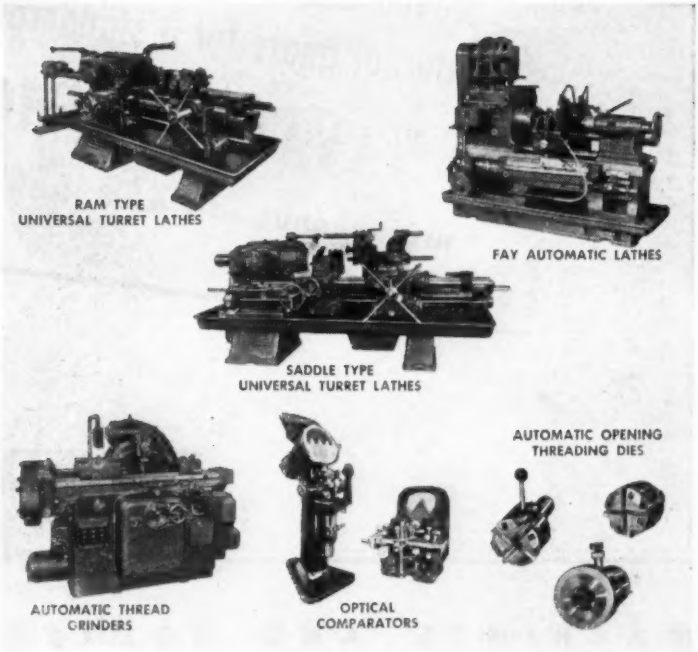
In the change-over ahead, **Jones & Lamson Optical Comparators** are going to be of tremendous value. Why not get ready now to meet—and beat—fierce postwar competition? Jones & Lamson Inspection Engineers can help you. Call on them now!

Advantages of Jones & Lamson Optical Comparators

1. Machine operation can be learned in minutes. . . **2.** One of the fastest inspection methods known. . . **3.** Permits study of tool wear and hardening distortion. . . **4.** Permits taking advantage of full allowable tolerances. . . **5.** Enlarged shadow can be studied by several persons at same time. . . **6.** Enlarged shadow can be photographed.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



GEAR SHAPERS CAN HANDLE YO

WAR PRODUCTION BULLETIN

The Fellows 100-inch Gear Shaper has proved ideal for the 2½ diametral pitch internal gears for a standardized

NAVAL GUN MOUNT

HIGH PRODUCTION *plus* HIGH PRECISION

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

LE YOUR

touqhest gear job

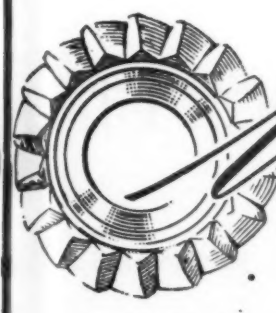
. . . AND WALK AWAY WITH IT !

In laying out designs for products involving large diameter, heavy-duty gears, it is important to bear in mind the availability of the Gear Shaper for *high precision* work up to 100-inches diameter.

Large diameter gears which must operate smoothly and render unfailing service under severe war-time conditions must be cut to precision limits and for this work, the Gear Shaper stands supreme.

Another point to bear in mind is that Fellows precision gear cutting now encompasses the full range from 1/16-inch diameter, .200 diametral pitch pinions up to gears of 100-inch diameter and 2 diametral pitch. For a survey of equipment available, write for "The Fellows Method" — 64 pages of informative data. The Fellows Gear Shaper Company, Springfield, Vermont — or 616 Fisher Building, Detroit, Michigan, or 640 West Town Office Building, Chicago, Illinois.

Fellows 100-inch Gear Shaper for External and Internal Spur Gears.

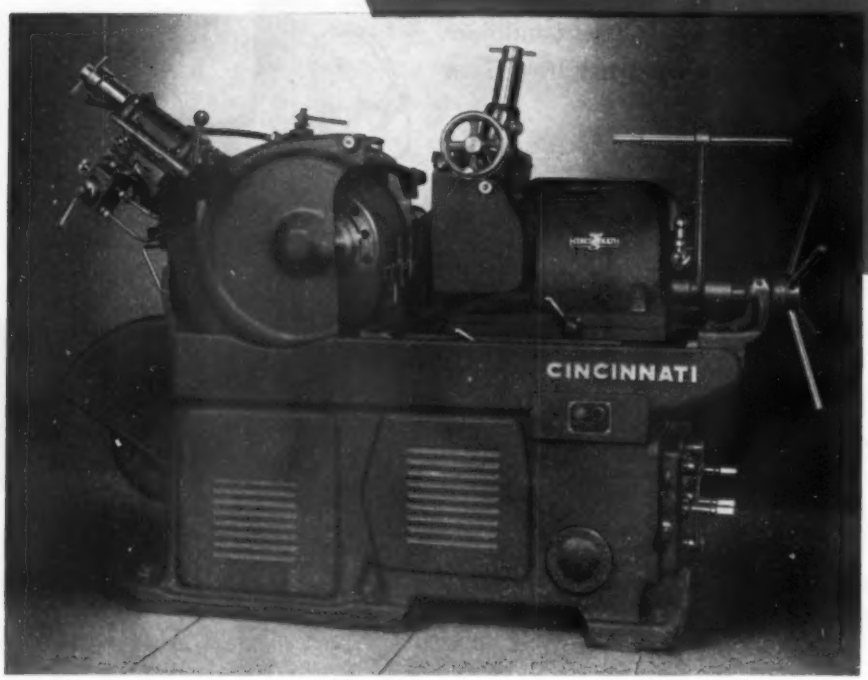


Method

. . . . FROM BLANK TO FINISHED GEAR

CENTERLESS GRINDING

4 DIFFERENT SIZE PARTS WITH ONLY ONE SET-UP



At the left is a front view of the CINCINNATI *No. 2 Centerless Grinding Machine. Complete specifications are covered in catalog G-456-1, a copy of which will be sent on request. Sweet's Catalog File gives a brief description of the* CINCINNATI *Grinding Machine Line.*

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

CINCINNATI

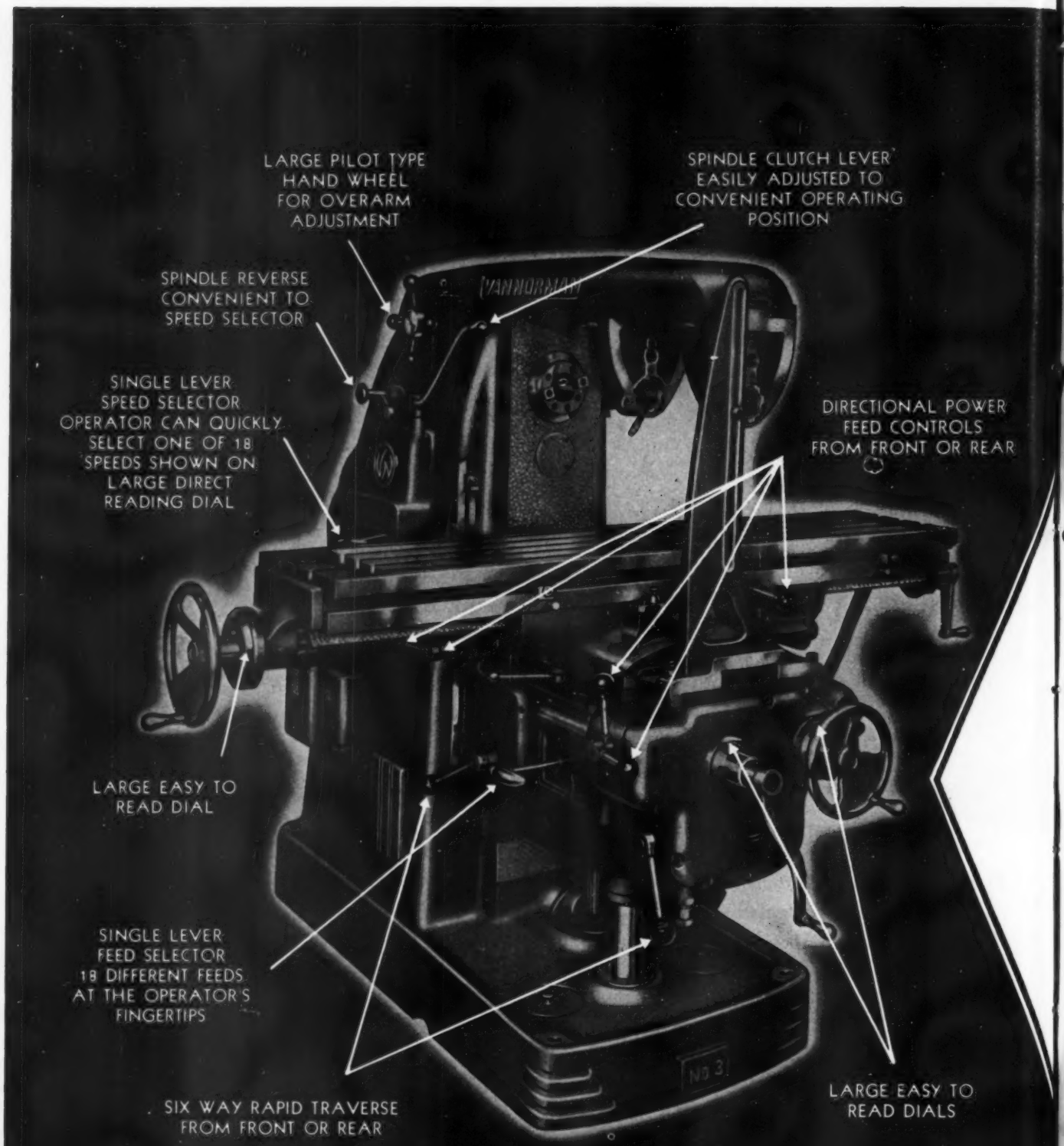
CENTER TYPE GRINDING MACHINES

Four sizes of flanged buttons are ground, pilot diameter and face, on a CINCINNATI No. 2 Centerless with the set-up illustrated above. A special loading mandrel, supported between wheels by vee blocks, has interchangeable details for handling the various sizes from the same set-up. Production is 150 pieces per hour . . . on no other machine could this grinding job be handled as efficiently. This is another example of the part CINCINNATI Centerless Grinders play in our all-out production. ¶ These production grinding machines are becoming more and more useful because of their adaptability to handle an unusually wide range of cylindrical and spherical parts, and their ability to grind virtually all kinds of materials. Parts made of any type of metal, rubber, wood, plastics, ceramics, glass, cork are ground more rapidly and more accurately by the CINCINNATI Centerless. ¶ In many instances the engineers here at Grinding Headquarters have licked tough grinding jobs by applying the centerless method. Take advantage of the service offered by this group of authorities and put your centerless or centertype grinding problems up to them.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES


LARGE PILOT TYPE HAND WHEEL FOR OVERARM ADJUSTMENT
SPINDLE CLUTCH LEVER EASILY ADJUSTED TO CONVENIENT OPERATING POSITION
SPINDLE REVERSE CONVENIENT TO SPEED SELECTOR
SINGLE LEVER SPEED SELECTOR OPERATOR CAN QUICKLY SELECT ONE OF 18 SPEEDS SHOWN ON LARGE DIRECT READING DIAL
DIRECTIONAL POWER FEED CONTROLS FROM FRONT OR REAR
LARGE EASY TO READ DIAL
SINGLE LEVER FEED SELECTOR 18 DIFFERENT FEEDS AT THE OPERATOR'S FINGERTIPS
SIX WAY RAPID TRAVERSE FROM FRONT OR REAR
LARGE EASY TO READ DIALS

Van Norman 3-S Horizontal Miller

VAN NORMAN COMPANY, SPRINGFIELD 7, MASSACHUSETTS

Every Feature Points to

Greater Operating Convenience

..on Van Norman's 3-S Horizontal Miller

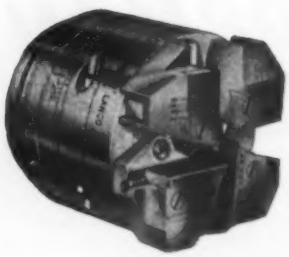
From either front or rear of this machine, the operator has complete directional control of power feeds right at his finger tips . . . also of the 6-way rapid traverse, by means of levers both on front and rear of knee. Spindle-clutch lever, too can be adjusted for operation from either side. 18 speed changes, from 25 to 1250 rpm, are instantly selected by a single lever . . . as are the 18 feed changes. Finally, accurate reading of dials is facilitated by their extra-large size, their plainly marked graduations, and their buffed chrome finish which prevents glare. In every feature, No. 3-S is designed for highest accuracy and output on horizontal work.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASS.

VAN NORMAN
Milling Machines

Official U. S. Navy Photograph

American submarines are powered by Diesel engines when operating on the surface. Here machinist mates check the mammoth twin Diesels in the engine room of a U. S. sub.



LANDIS

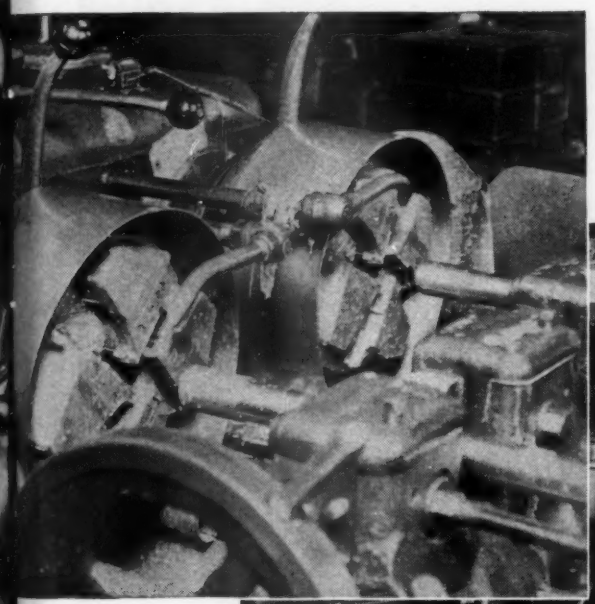
Diesel Engine Cylinder Studs *threaded by* LANDMACO

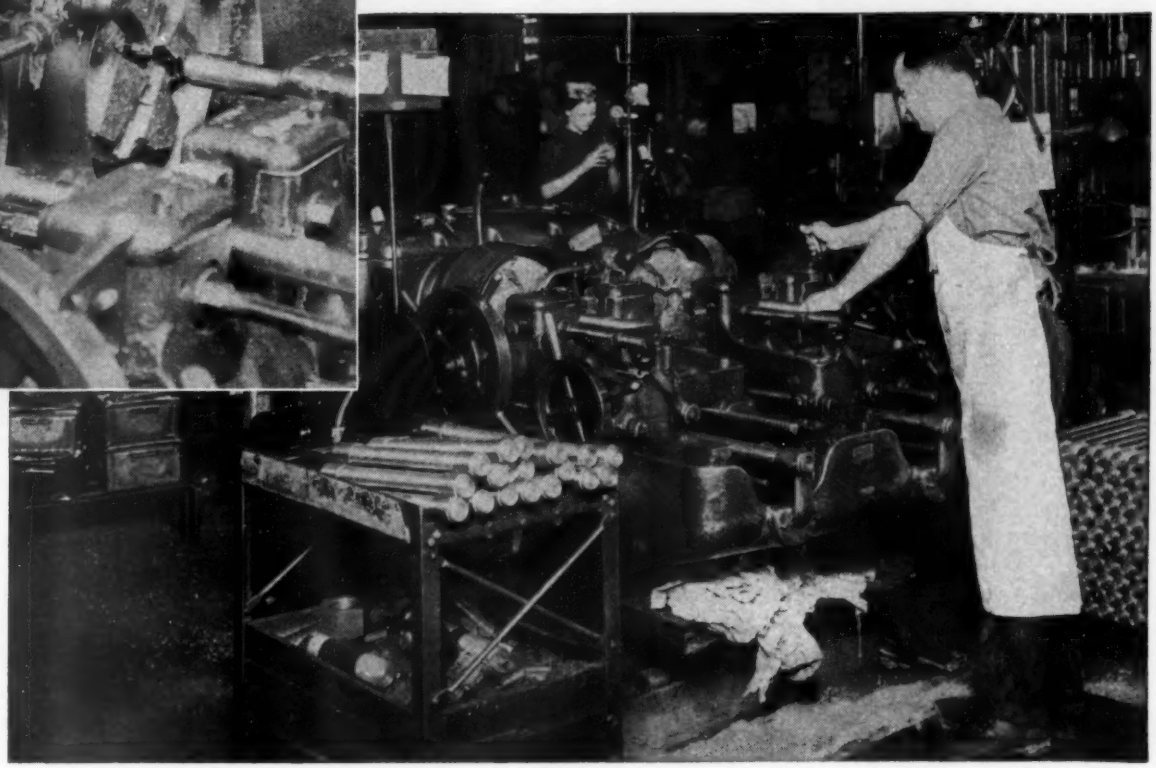
Cylinder Head Studs are a vital part of the Diesel Engine.

If the engine is to perform unfailingly—and it cannot fail—every part must function perfectly hour after hour, possibly for days or weeks.

The threads of the cylinder head studs—the vital link which literally holds the engine together—are held to extremely close tolerance specifications. The studs are made from alloy steel and present a difficult threading operation. Yet the manufacturers of these parts have little difficulty in producing entirely satisfactory results when employing the LANDMACO Threading Machine.

Perhaps the LANDMACO Threading Machine will expedite your difficult Threading Operations too.





Write for Bulletin No. H-75

MACHINE CO. WAYNESBORO PENNA. U.S.A.

CINCINNATI HYPRO PLANERS AT WORK FOR VICTORY . . . "Down Under"

Photo—Sydney Morning Herald

● Many thousands of miles away, in such far-off cities as Adelaide, Syndey and Melbourne, CINCINNATI HYPRO Planers are working 24 hours a day . . . machining metal for Victory! Other CINCINNATI HYPROS are serving in all the British Dominions. Still others are in operation in India. They are backing the Russian attack . . . they are aiding our heroic friends in the Republic of China.

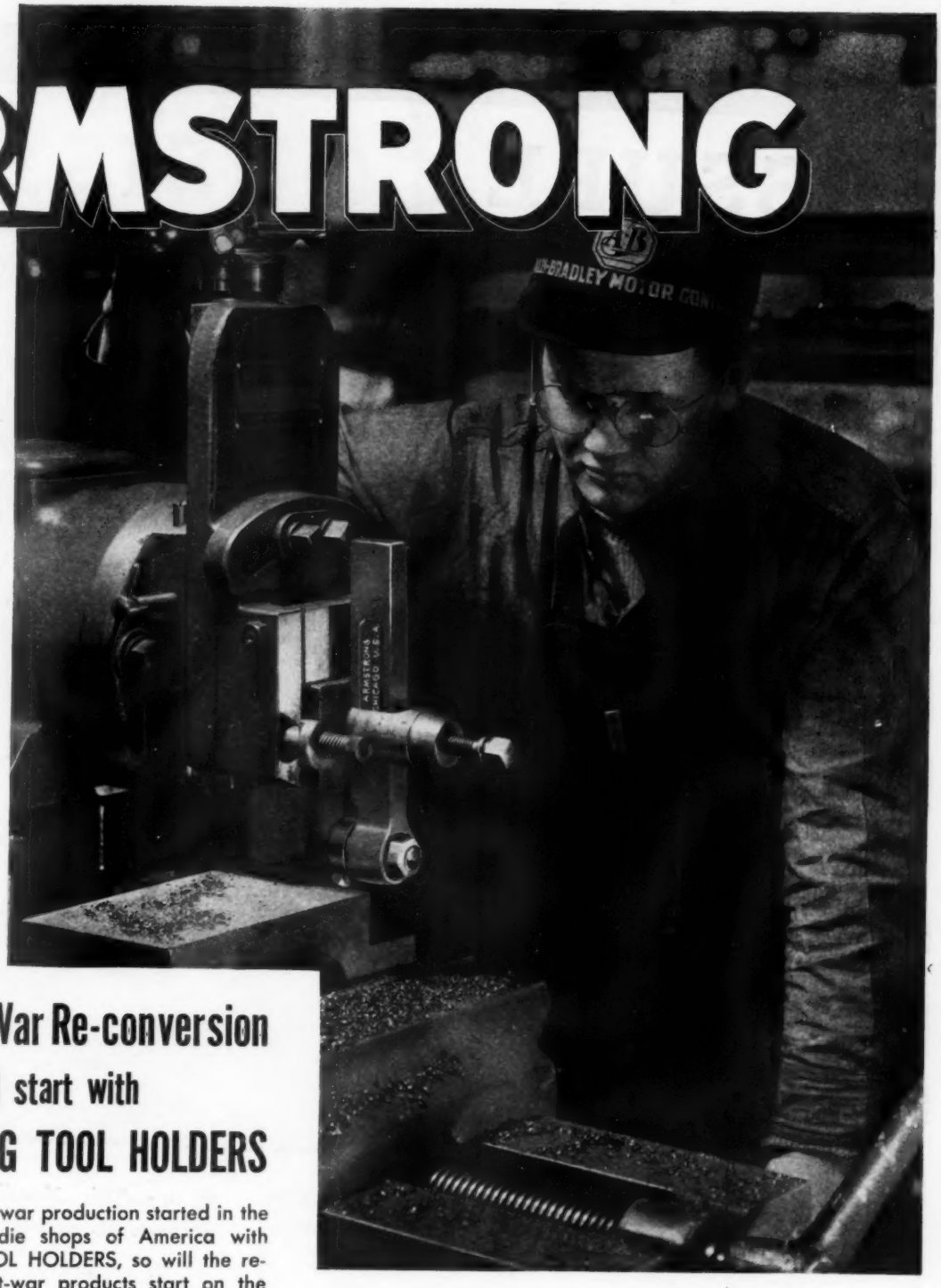
Our Allies have discovered what American manufacturers have known for 45 years . . . that CINCINNATI Planers machine parts fast and accurately . . . that they are designed to withstand the heaviest cuts at more than rated motor speed . . . and that the Hypro Herringbone Drive provides unparalleled smoothness of operation. ●

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

ARMSTRONG



Your Post-War Re-conversion will start with ARMSTRONG TOOL HOLDERS

Just as the shift to war production started in the tool rooms and die shops of America with ARMSTRONG TOOL HOLDERS, so will the re-conversion to post-war products start on the tool room lathes, planers, slotters and shapers. Now is the time to equip each of these machine tools with its full complement of ARMSTRONG TOOL HOLDERS. They will enable you to increase production of War Material NOW, for with the correct ARMSTRONG TOOL HOLDER for each operation you can step up speeds and feeds (often double hourly output) safely and without loss of cutting efficiency. Then too, when the war ends you will be tooled-up for every operation, ready to start *instantly* on re-converting your plant to post-war production. ***Write for Catalog today***

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. CHICAGO, U. S. A.

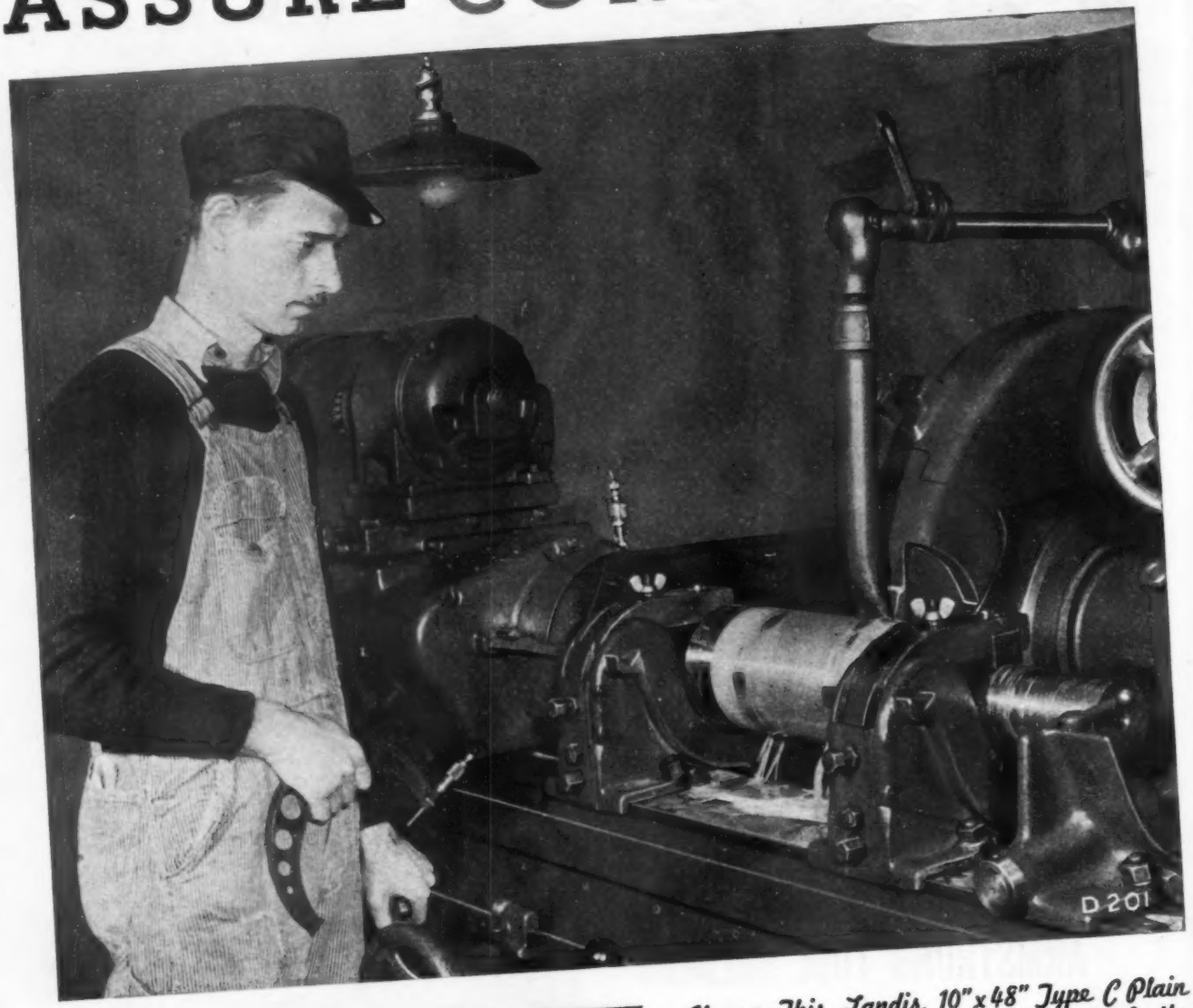
Eastern Warehouse & Sales Office:
199 Lafayette St., New York

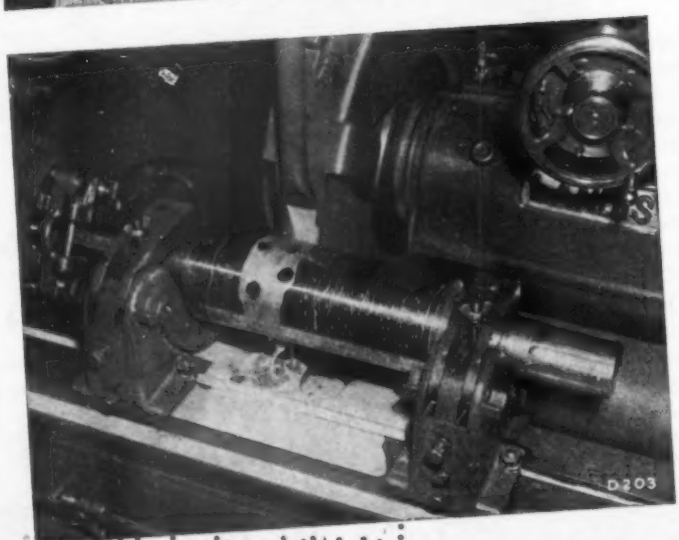
Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

TO FINISH THE JOB QUICKER . . .

ASSURE CONSISTENT





Above:—This Landis 10" x 48" Type C Plain Grinder is installed in the plant of the Allison Co., Connecticut. It is used for the grinding of feeder rolls used in the manufacture of abrasive wheels.

Left:—A close-up of the operation shown above. Notice that the roll is not ground between centers, but instead is held by two roll heads and is driven by the headstock which is equipped with an equalizing drive. Close accuracy results.

Unusual Performance As Usual

PRECISION LANDIS GRINDERS

MACHINERY

PRECISION BY

USING A LANDIS LIKE THIS

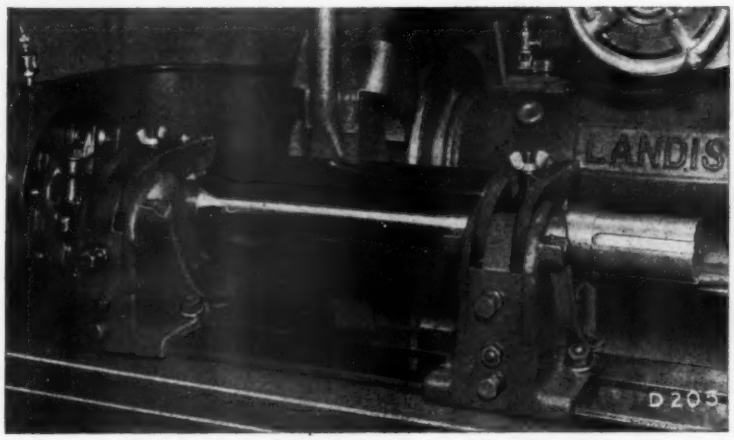
Why waste valuable time coaxing precision and rapid production from that old, out-dated grinding machine?

Why not assure yourself of consistent precision performance by using a Landis grinder for the jobs that are in a hurry. Consider for instance...

The** Allison Company **of Connecticut uses a** Landis 10" x 48" Type C Plain Hydraulic Grinder **for the grinding of feeder rolls used in the manufacture of abrasive cutting and slitting wheels.** Accuracy **is of primary importance.

***On the Landis grinder the roll diameter is finish ground** within a limit of +.001" **and the entire length of the roll is held** within a tolerance of +.001". **Nor is production sacrificed in order to obtain this precision. In spite of the close limits** production has risen from 1 roll per 10 hour day to 4 rolls per 8 hour day.*

You can depend on Landis grinders for precise, productive performance—all of the time. YOU profit only when it takes place in your plant.



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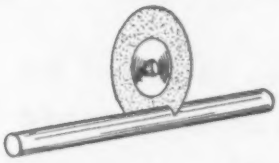
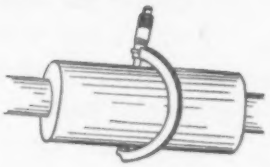
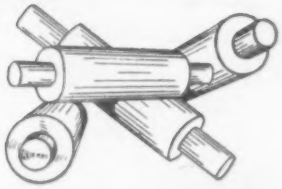
THIS IS THE STORY



The Allison Company, Connecticut, manufactures abrasive cutting wheels used to cut or slit metal, glass or ceramic products. These wheels are made in diameters of from 1" to 20" and in thickness from .015" to 1/8", however, certain special wheels are now being made that are held to the almost unbelievable size of .005" in thickness.

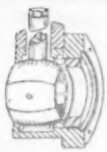


In making these wheels, feeder rolls are used to roll out the processed abrasive impregnated rubber to its final thickness. Because the accuracy of the wheel is determined by the rollers, precision is highly important. The Allison Company is the only firm in the world that makes abrasive wheels within such close tolerances.



Concerning the performance of their Landis grinder the Vice President of The Allison Company says, "It has satisfactorily met every requirement of fast and accurate work demanded of it." This company knows that their grinding machine can be depended upon for consistent precision grinding at a high rate of production.

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA



MICROSPHERE WHEEL SPINDLE BEARINGS

MULTI-SPEED HYDRAULIC TABLE TRAVERSE

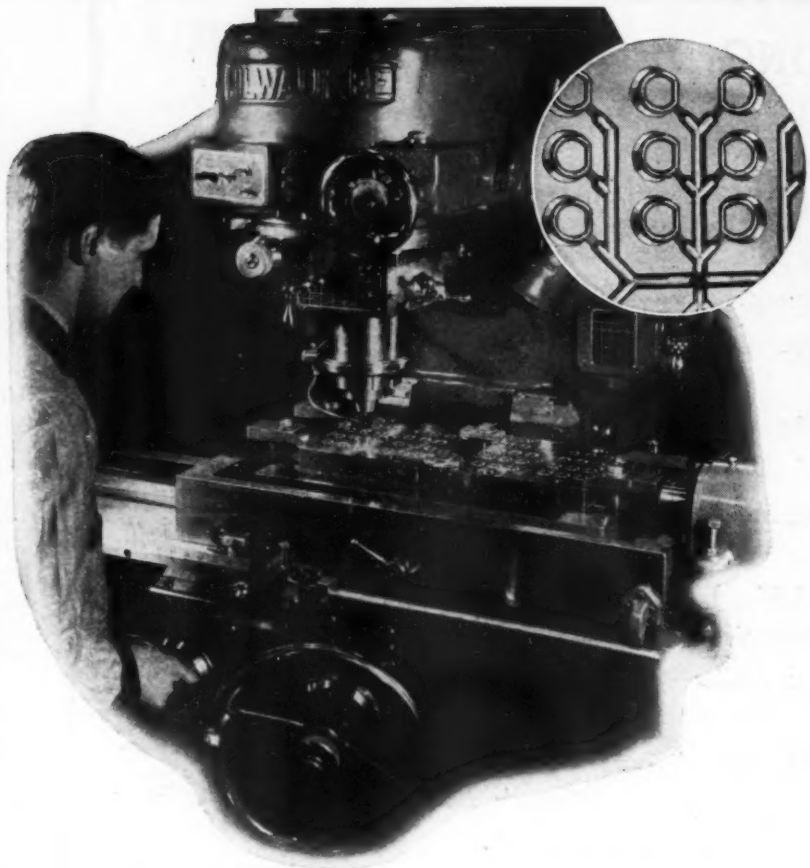
HYDRAULIC STRAIGHT INFEED

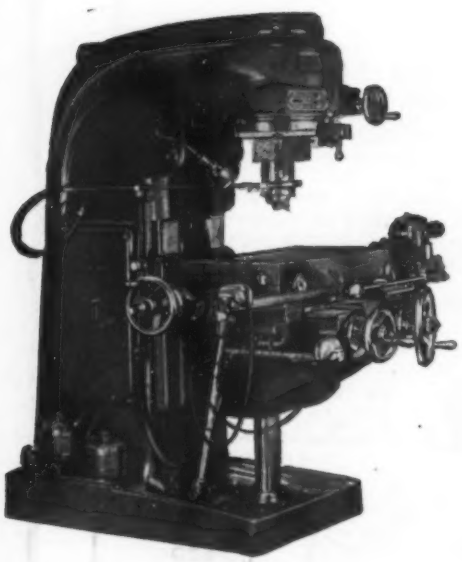
388

24 CAVITY MOLD FINISHED IN *18* HOURS!

Estimated time required by other methods was more than 100 hours!

THE two halves of the 24 cavity mold were aligned and properly spaced on the Milwaukee Rotary-Head Milling Machine table. The first milling operation was performed on the first cavity in the back row. Then, by moving the table the proper distance — the same operation was performed on the next cavity. Since the cavities in the two mold halves were identical, this and succeeding operations were simply carried over to the opposite half of the mold. Each operation was readily performed in proper sequence and the entire 48 impressions of the 24 cavity mold were machined completely at a single set-up in 18 hours.





KEARNEY & TRECKER'S ROTARY HEAD MILLER

The Most Versatile Machine Ever Designed for Mold and Die Work

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements—possible only with this machine—transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

•

Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies for plastics.

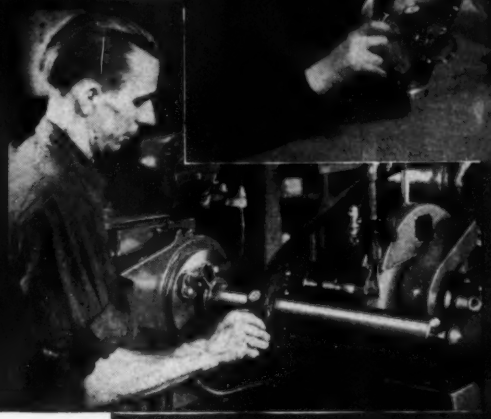
Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

STANDARD

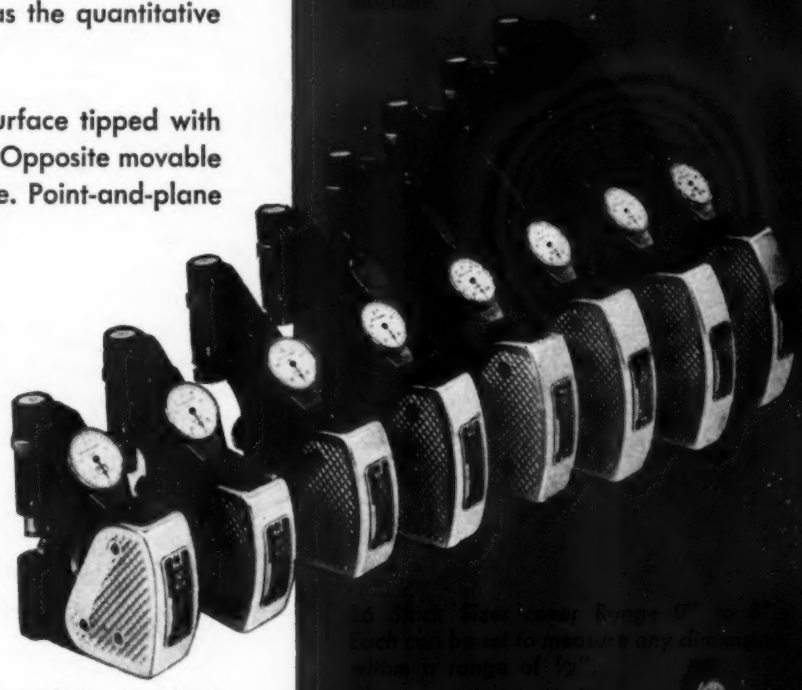
ACCURATE as a Bench Comparator but FAST and PORTABLE!



HERE'S A GAGE that combines PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". STANDARD Dial Snap Gage is portable and easy to handle as a conventional snap gage, yet has the quantitative accuracy of a stationary instrument.

Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically *defies wear*. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

STANDARD Dial Snap Gages speed inspection, guard against rejects and material spoilage and eliminate human variations not only on precision work but also where tolerances are comparatively liberal. Write for Special Bulletin.



FEATURES

1. High precision indicator approximately 1" in diameter graduated .0001". Bezel rotates for convenient setting.

2. Measuring anvil tipped with tungsten carbide. Indicator protected against shock by sudden applications to measuring pin.

3. Tungsten carbide tipped adjustable anvil has flat lapped serrated surface. Minute chips and dust readily clear from it, helping insure accuracy.

4. Adjustable, spring-cushioned safety stop reduces jar, helps hold work in correct gaging position.

5. Air space between grip and body of instrument protects against hand heat, further safeguards accuracy.

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

BROOKLYN MARINER LOSES SHIRT . . . and Norton Handbook

Brooklyn N. Y.
Oct 7, 1943

Dear Sir:

Sometime ago I received a Norton book entitled "A Handbook on Tool Room Grinding." This was of enormous help to me, but because of an accident I lost it. I am an engineer on a merchant ship, and the book, with all of my possessions, was lost. If you have any more copies may I please have one?

Aboard ships anyone who can run a lathe, shaper, milling machine etc., is considered a godsend. Therefore I meet problems which would be given to more experienced machinists ashore. Since no two jobs are alike, they entail much grinding of different tools, in which your book played a very prominent role.

As my time ashore is limited and I am very desirous of having this book before I sail again I will appreciate your sending it special delivery.

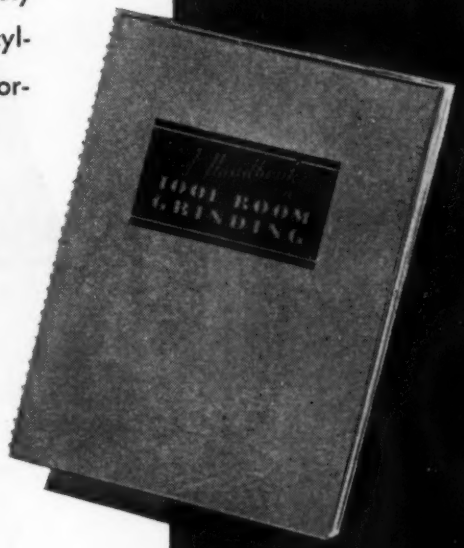
Yours truly
Alexander Campbell

GRINDERGRAM

Do not use "any old oil" in lubricating the wheel spindle. Spindle oil should be of the proper grade and viscosity, clean and uniform for best results.

HAVING pioneered precision grinding developments for the past 40 years, Norton has accumulated much grinding lore. This includes a wide variety of printed matter and engineering data on cylindrical, surface and tool room grinding. Norton machine engineers, experts in precision, will gladly serve you as authoritative problem-solvers.

The "Handbook on Tool Room Grinding" so heartily approved by Engineer Campbell, and "What, Why and How," a booklet dealing with grinding essentials and fundamentals are but two of the publications available. There are also manuals and instruction booklets dealing with various phases of grinding and machine operation. This material is free for the asking. If you are interested in instruction manuals, please be sure to give serial numbers of the Norton machines involved so the correct publications can be sent.



NORTON COMPANY
WORCESTER 6, MASS.
New York Chicago Detroit Cleveland Hartford

M-471

EXPERIENCE? THIS AUTOMATIC LATHE SUPPLIES IT!

"LOOK! This machine can turn many different kinds of parts needed by our armed forces—in big volumes! All *you* have to do is put the rough forging right here—and pull the little starting lever. When the machine stops—you take it out, put in another. The *lathe itself* knows how to do the rest—faster than anyone here could do it!"

THE GISHOLT NO. 12 HYDRAULIC AUTOMATIC LATHE is one of the machines that practically eliminate the training problem. Adaptable for a wide variety of between-centers and chucking work, it is capable of sustained high speed production within close limits of accuracy. Write for complete information.

GISHOLT MACHINE COMPANY
1201 Washington Ave. · Madison, Wis.

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

LOOK AHEAD • KEEP AHEAD • WITH GISHOLT IMPROVEMENTS IN METAL TURNING

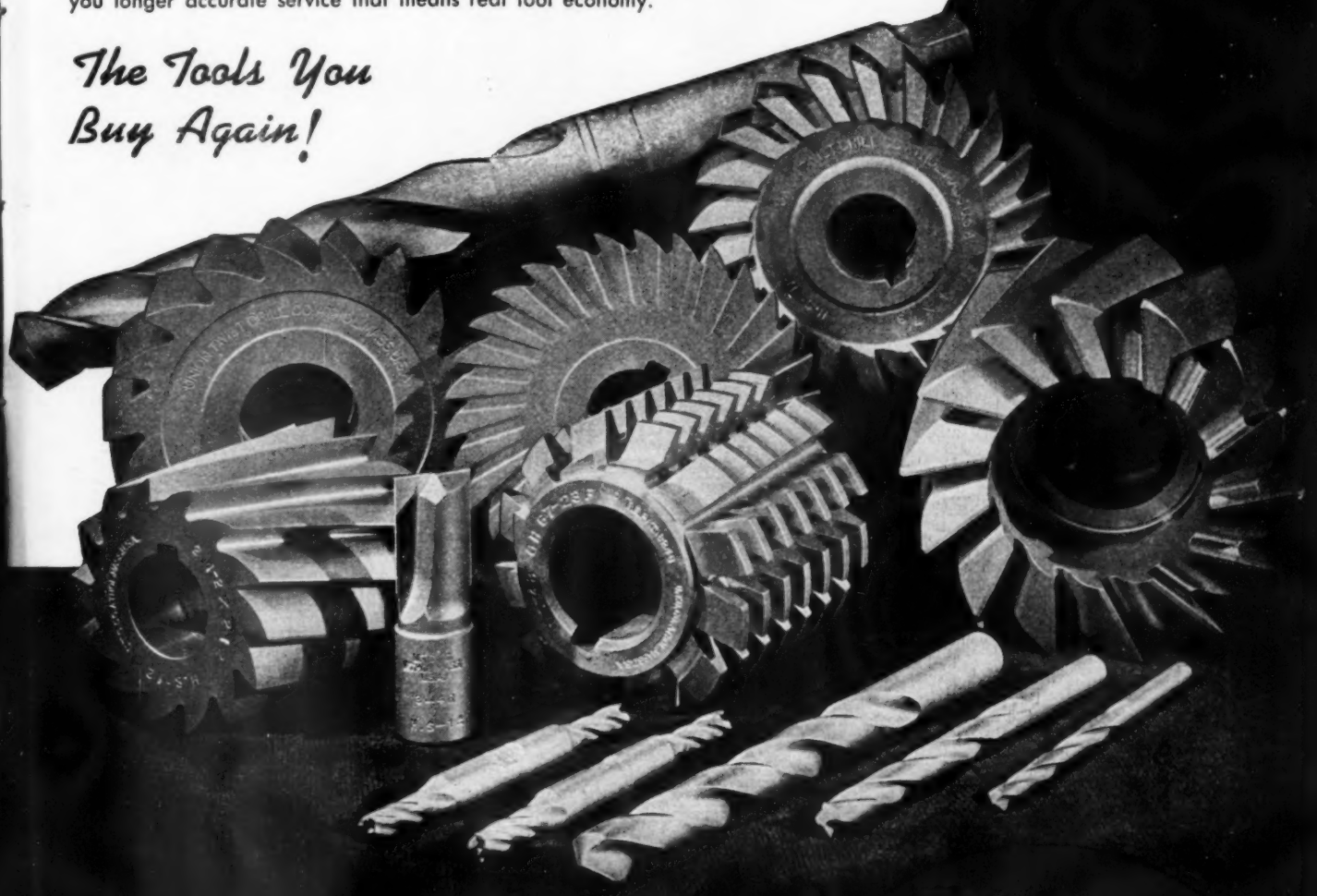
UNION

FOR ACCURACY THAT LASTS ON TOUGH WARTIME JOBS!

In today's war production, accuracy is doubly important, and the LONG-LASTING ACCURACY of Union Tools is helping to make wartime jobs economical as well as efficient. In these days of tool shortages, priorities and scarcity of labor it is important not to waste tools, materials or time.

Buy Union Tools. You'll find that with proper care they'll give you longer accurate service that means real tool economy.

The Tools You Buy Again!



UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

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New York: 61 Reade St.
Chicago: 11 So. Clinton St.
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Divisions of the UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

CARD FOR WARTIME SERVICE

QUALITY TAPS

Under present demands for quantity production, quality must be maintained! When the pressure is on to turn out more and more war materials, Card Taps reveal their inherent ability to turn out high quality work on a high production basis. Whatever degree of accuracy you demand . . . whatever material you work in, Card can supply the Taps for quality war production.

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UNION BUTTERFIELD CARD

Butterfield

For Tool-Economy and Time-Savings!

Now, when tool-economy and time - economy are equally important, you can count on Butterfield! Shops that select Butterfield Taps and Reamers as standard equipment know from experience that these tools combine, in perfect proportion, the qualities that result in tool-savings and time-savings on every job. You need not sacrifice time to save tools, or burn up tools to meet production deadlines. Choose Butterfield and get both!

Divisions of the UNION TWIST DRILL CO.

BUTTERFIELD DIVISION
DERBY LINE, VT. ROCK ISLAND, QUE.

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UNION BUTTERFIELD CARD

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button

The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

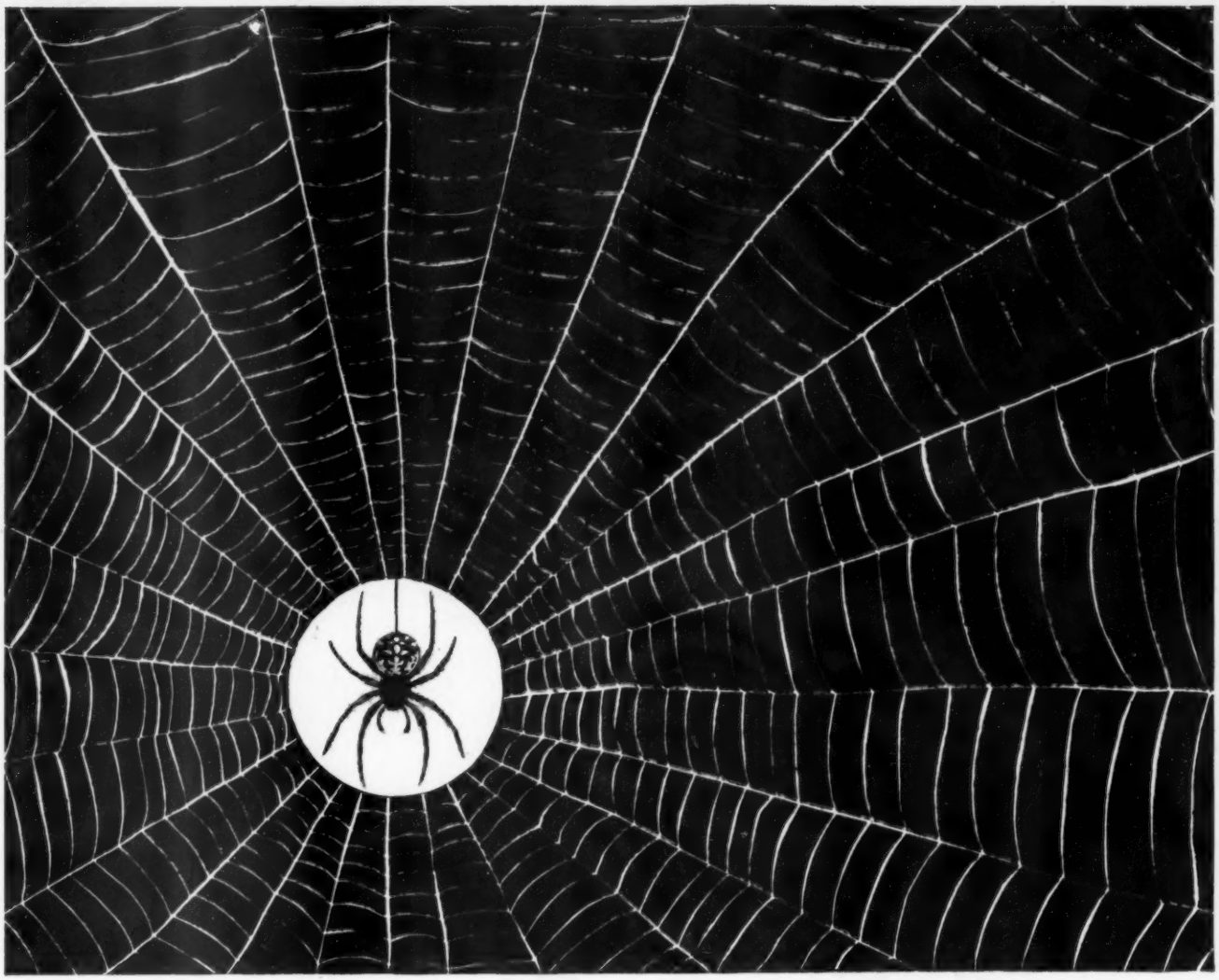
Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DE VLIEG MACHINE COMPANY
450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS



The story of a master weaver...

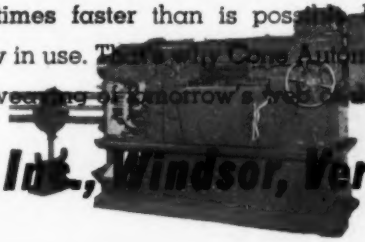
EVER WATCH a garden spider at work? It's no beauty itself—but what it can do in producing beauty! It weaves filaments of silk—silk it made itself—into strands 100 times finer than human hair, yet stronger than its equivalent in steel!

And because of its inexhaustible energy, it often completes an entire web in 30 or 40 minutes. This high-speed production requires extraordinary coordination of all 8 legs as the spider balances and guides the silken filaments into patterns of geometric perfection.

But if you think Nature can't be equalled, here's one to make a spider green with envy: On one job, a 2⅝" Six Spindle Conomatic in 12 seconds per piece completes 10 operations, one of which comprises drilling an eccentric hole without stopping the spindle. Operating 140 hours a week, Cone Multiple Spindle Automatic Lathes are today turning out millions of shell bodies and precision parts for guns, tanks, airplanes.

In peacetime, the mass production of metal parts is an economic necessity... in wartime, a military necessity. That's why the Cone Multiple Spindle Automatic Lathe, one of the key production machines of peacetime industry, is of such vital importance in wartime.

In the peace to come, Cone Multiple Spindle Automatic Lathes will be used in many operations for production **10 times faster** than is possible by many methods now in use. That's why Cone Automatics will help in the weaving of tomorrow's web of destiny.

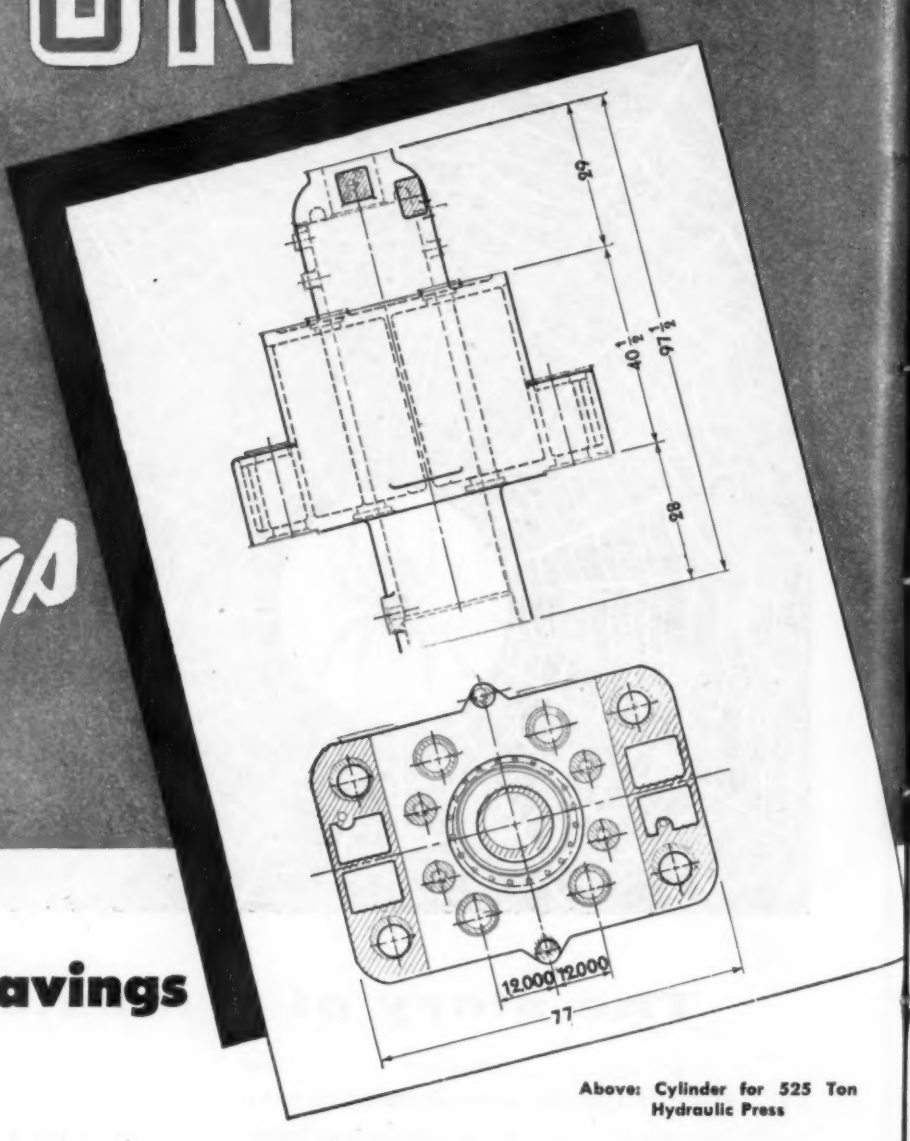


CONE Automatic Machine Company, Inc., Windsor, Vermont

6¾ TON CYLINDER

MACHINED

in Two Settings



Above: Cylinder for 525 Ton Hydraulic Press

With 75% Savings in Time

This prominent manufacturer of large hydraulic presses uses his G. & L. Horizontal Boring, Drilling and Milling Machine for machining all cylinders. Ninety-five per cent of his work requires indexing. Consequently, a rotary indexing table is used in conjunction with the machine. This eliminates resetting and indicating time and saves 75% of the machining time on most jobs.

Operations Include Boring, Drilling, Milling and Tapping

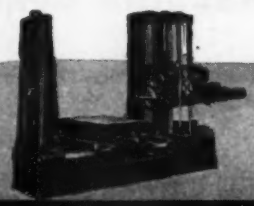
The wide speed and feed range available on the G. & L. Horizontal makes it possible to include the machining of all surfaces and holes, including the drilling and tapping operations. This eliminates the necessity of removing and transferring large, heavy parts from machine to machine.

87½" Continuous Bore 22½" Long

Of interest is the method used in boring the long cylinder. The bore is not relieved, but one continuous surface of cast steel. After the bar has been fed to its full length of travel, the boring head is unclamped, the bar run back and the head reclamped. The boring is then continued from the point at which it was previously stopped... without leaving an objectionable mark.

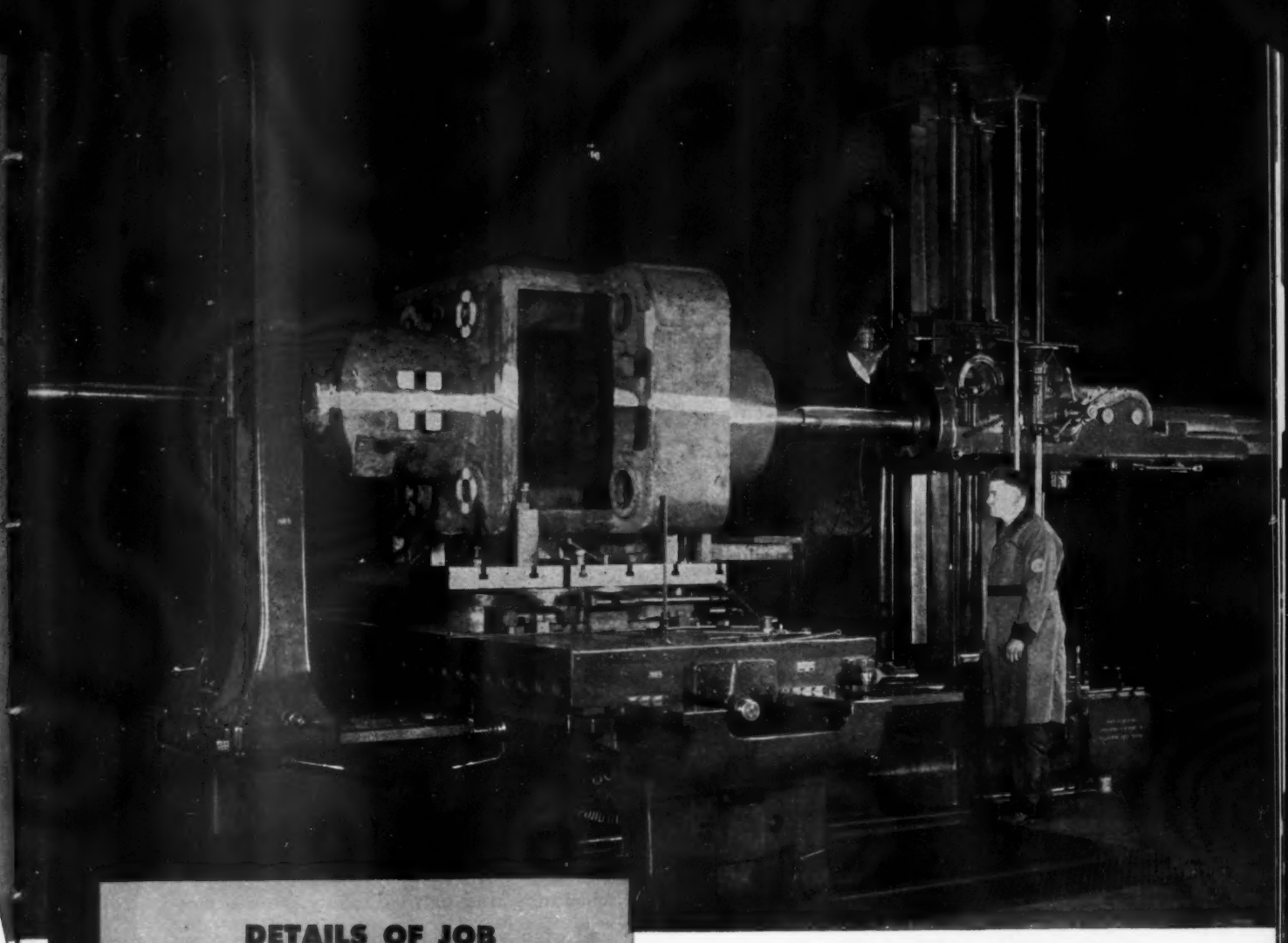
GIDDINGS & LEWIS

138 DOTY STREET



Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.



Above: First Set-up in Machining Cylinder

DETAILS OF JOB

First Set-up

Casting is set on rotary table in position shown above. The center bore is then picked up and vernier readings of headstock and table registered.

Operations

The cylinder is first rough bored to determine any defects. It is then semi-finished and finish bored. A final burnishing operation giving the cylinder an extremely smooth surface completes the boring. Subsequent operations consist of milling, drilling and tapping in accordance with the drawing at left.

The part is then indexed 90° and pad near open end of cylinder finished.

The part is then indexed another 90° and all pads and surfaces milled, and all holes drilled and tapped.

Second Set-up

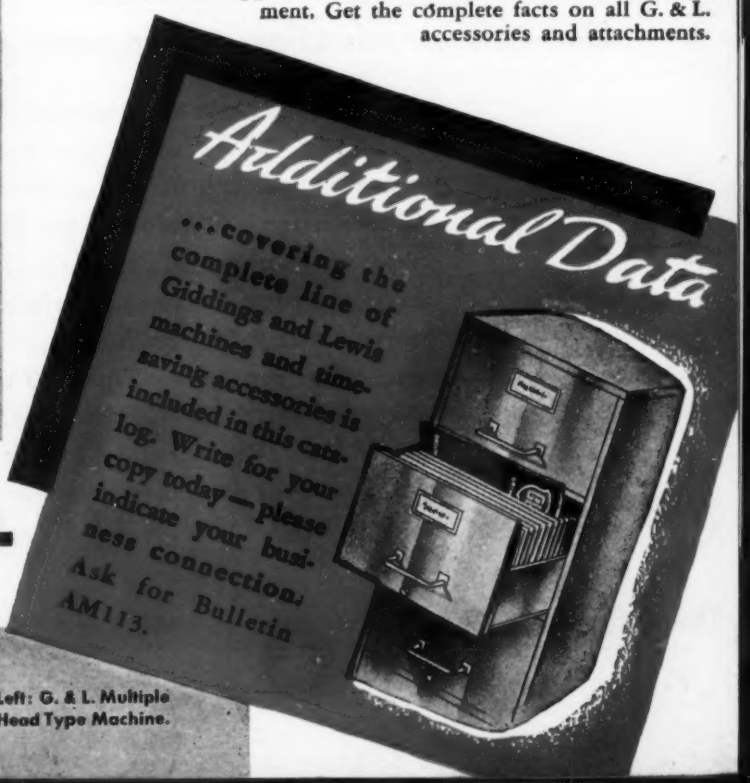
A plug is set in the middle of the rotary table and the entire cylinder set over the plug with the small end down.

Operations

The various pads at the small end of the cylinder are all milled, drilled and tapped by indexing around in a similar manner to the method used in the first set-up.

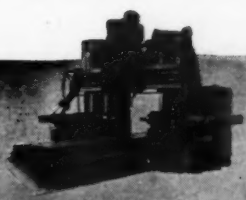
Rotary Table Permits Machining in Only 2 Settings...

The data on this interesting installation is presented to illustrate the ease with which massive parts can be machined on G. & L. Horizontal Boring Mills in conjunction with G. & L. Rotary Tables. Perhaps you will be able to cut your machining time with the application of one of these tables to your equipment. Get the complete facts on all G. & L. accessories and attachments.


Additional Data
...covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today — please indicate your business connection. Ask for Bulletin AM113.

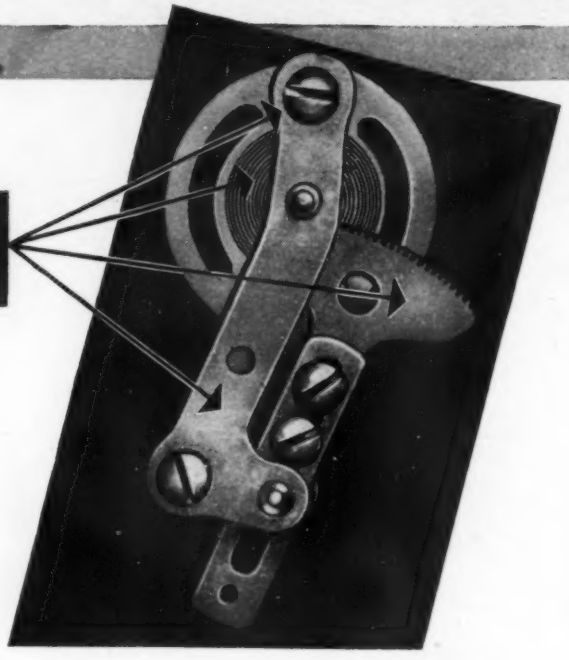
MACHINE TOOL CO.
FOND DU LAC, WIS.

Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

WHICH **Stainless Steels** for these parts?



Here Is How Carpenter Can Help You Find the Answers To Your Stainless Selection and Fabricating Problems . . .

• When selecting a Stainless Steel to meet your particular design-engineering requirements—or when you could use fabricating assistance—take advantage of Carpenter's diversified experience with Stainless problems.

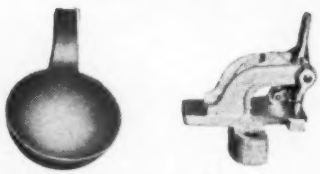
To help you quickly solve new and difficult Stainless design or fabricating problems, here is easy-to-use information about several Carpenter Stainless Steels. These straight chromium Stainless Steels, widely used in the form of strip are not hardenable by heat treatment. They provide ample corrosion resistance for many applications, plus special properties such as scale resistance, electrical resistance and extra ductility. Future messages will give you useful information on other types of Stainless to meet specific conditions in service. Meanwhile, for further help, get in touch with your nearby Carpenter representative. He can provide real assistance, and will keep you in close touch with our Metallurgical Department.

Use this production-engineering help...

"Working Data for Carpenter Stainless Steels" will provide you with much useful information on selection and fabrication—to help you get the most from every pound of Stainless. Use it to help you plan the use of Stainless for today's war jobs, and for tomorrow's peacetime products. This 98-page book is offered free to Stainless users in the U. S. A. For your copy, just drop us a line on your company letterhead.

more than corrosion resistance

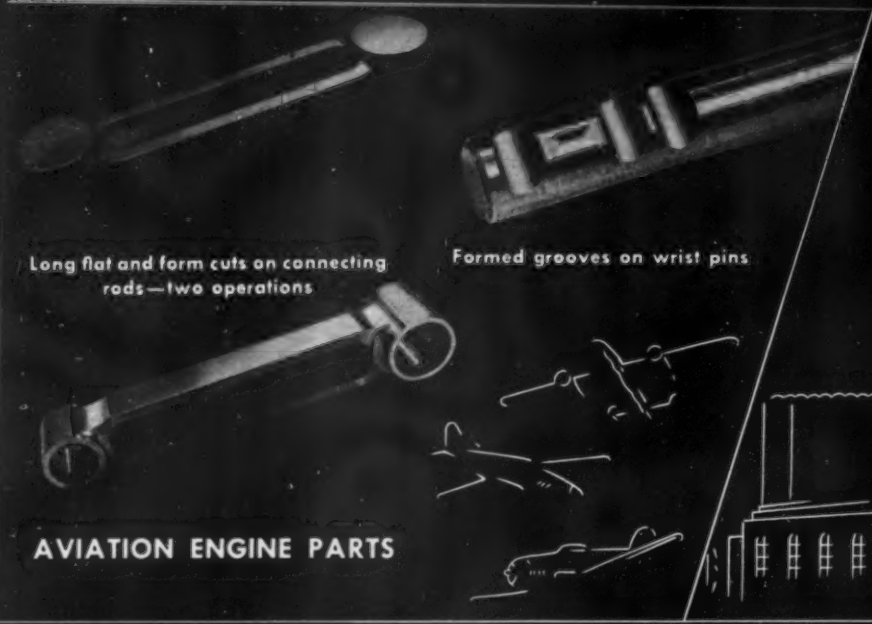
The Carpenter Steel Company, 109 W. Bern St., Reading, Pa.

	DESCRIPTION	PHYSICAL PROPERTIES
For Products That Need Specific Corrosion or Scale Resistance... ***Carpenter*** **STAINLESS No. 3** **(Type 443)** ➡  *Carpenter Stainless No. 3 gives longer life to products ranging from clips used on textile machines to ladles for molten non-ferrous metals.*	● This grade compares favorably with 18-8 type Stainless in both corrosion and scale resistance. It resists all ordinary corrosive conditions including salt spray, foodstuffs, most organic chemicals and many fused salts. Not subject to intergranular corrosion from hot working or welding—it is recommended for continuous high temperature service. Carpenter Stainless No. 3 cold rolled strip is very ductile, ideal for complicated press work. In bar form, it is easier to machine than the non-free-machining 18-8 types. Used for furnace parts, soot blower tubes, stirring rods and other products demanding specific corrosion or scale resistance, this Stainless is available in the forms of forging billets, tube billets, hot rolled and cold drawn bars, centerless ground bars, wire and strip.	Carpenter Stainless No. 3—Type 443—(Carbon .15%—Chromium 20.00%—Copper 1.00%) **Specific gravity**— 7.69 **Melting point**— Approximately 2500°F. **Specific heat**— .11 **Thermal conductivity**— .070 C.G.S. units at room temperature. **Coefficient thermal expansion**— .0000055 average 60°F. to 1500°F. **Specific electrical resistance**— 410 ohms per cir. mil ft. at 68°F. Temperature coefficient—(68°F. to 1300°F.) .00060 per deg. F. **Tensile properties**— Does not respond to heat treatment. In annealed condition its *Tensile Strength* is approximately 90,000 lbs. per sq. in.
If You Need Uniform Electrical Resistance . . . ***Carpenter*** **STAINLESS No. 1-JR** **(Type 406)** ➡ *The uniform electrical resistance and easy forming properties of No. 1-JR are essential in this edge-wound resistor coil.*	● This grade has a high specific electrical resistance and low temperature coefficient. Carpenter Stainless No. 1-JR (Type 406) is the most popular resistance material in the "Stainless Series". No. 1-JR can be hot forged or cold formed. Flat sections are especially annealed to wind smoothly edgewise into coils. It is easily punched or blanked. Usually supplied as hot or cold rolled strip, No. 1-JR is also available in the form of hot rolled or cold drawn round wire.	Carpenter Stainless No. 1-JR—Type 406—(Carbon .10%—Chromium 13.00%—Aluminum 3.50%) **Specific gravity**—7.352 **Specific heat**— 68°F.—.114 400°F.—.133 950°F.—.172 **Coefficient thermal expansion**— .0000080 average 68°F. to 1475°F. **Specific electrical resistance**— 680 ohms per cir. mil ft. at 68°F. Temperature coefficient—.00016 per deg. F. between 68°F. and 1100°F. **Elastic modulus**—29,000,000 For tensile properties at elevated temperatures, see the working data book described on the opposite page.
Faster Output—Fewer Rejects With This Stainless Strip . . . ***Carpenter*** **STAINLESS No. 6 (Type 430)** ➡ *Intricate shapes and sharp radii present no problems with Carpenter Stainless No. 6. It is easy to stamp or blank this soft, ductile strip.*	● You won't find a Stainless Strip that is easier to fabricate. Carpenter Stainless No. 6 is ideal for making blanked, stamped or formed Stainless parts. This Stainless provides positive resistance to corrosion from atmosphere, mine water, steam, carbonic acid, crude oil, blood, alcohol, etc. Carpenter Stainless No. 6 is used extensively in the forms of cold rolled strip and cold drawn wire. In the lighter gauges, often used for trim, it is furnished with a very smooth bright finish that resists scuffing and wear. For machined parts made from forgings or bar stock, Carpenter Stainless No. 6-FM provides free-machining properties.	Carpenter Stainless No. 6—Type 430—(Carbon .10%—Chromium 17.00%) **Specific gravity**—7.71 **Coefficient thermal expansion**— .0000065 average between 60°F. and 1500°F. **Elastic modulus**—29,000,000 **Properties of No. 6 Cold Rolled Strip:** When cold rolled, annealed dead soft, and with a bright, smooth surface, this Stainless will show the following average properties: **Tensile strength** lbs. per sq. in. . . . . 75,000 **Rockwell hardness** . . . B-80 **Erichsen**—1" tools 8

note: *The physical properties of all grades of Stainless depend upon form, heat treatment or cold working. Wider ranges of properties are available in certain forms. Take up your specific problems with our Metallurgical Department.*

Carpenter STAINLESS STEELS

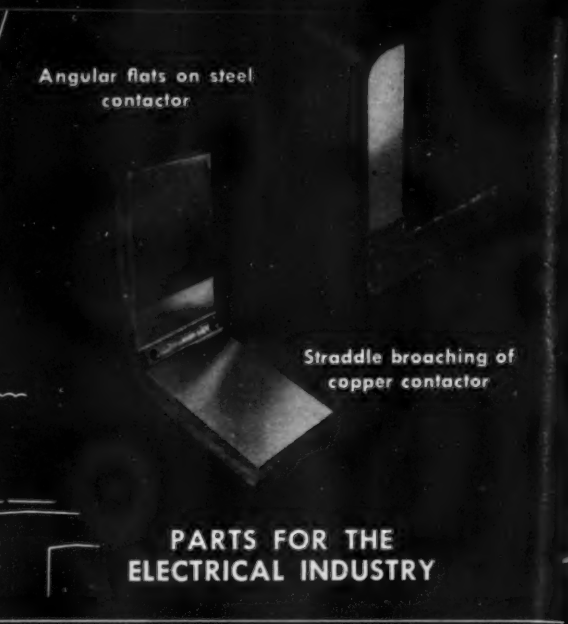
BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia



Long flat and form cuts on connecting rods—two operations

Formed grooves on wrist pins

AVIATION ENGINE PARTS



Angular flats on steel contactor

Straddle broaching of copper contactor

PARTS FOR THE ELECTRICAL INDUSTRY

ORDNANCE PARTS

Wide contour form broached

Broaching of long rounded form

Flat and deep slot broached in one operation —small brass part

Combination of form and flat broaching.

Long flat broaching cut

Surface Broaching

of Battle Front and Home Front Weapons

In winning the war and in the days to follow, surface broaching is and will continue to show remarkable savings in machining costs. Many jobs that were slow and expensive when handled by conventional machining methods are now being surface broached faster and cheaper on Footburt machines. It will pay you to investigate the advantages of surface broaching in accurate finish, high production and low tool maintenance costs thru Footburt Surface Broaching. *Send your blueprints and production requirements.*

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

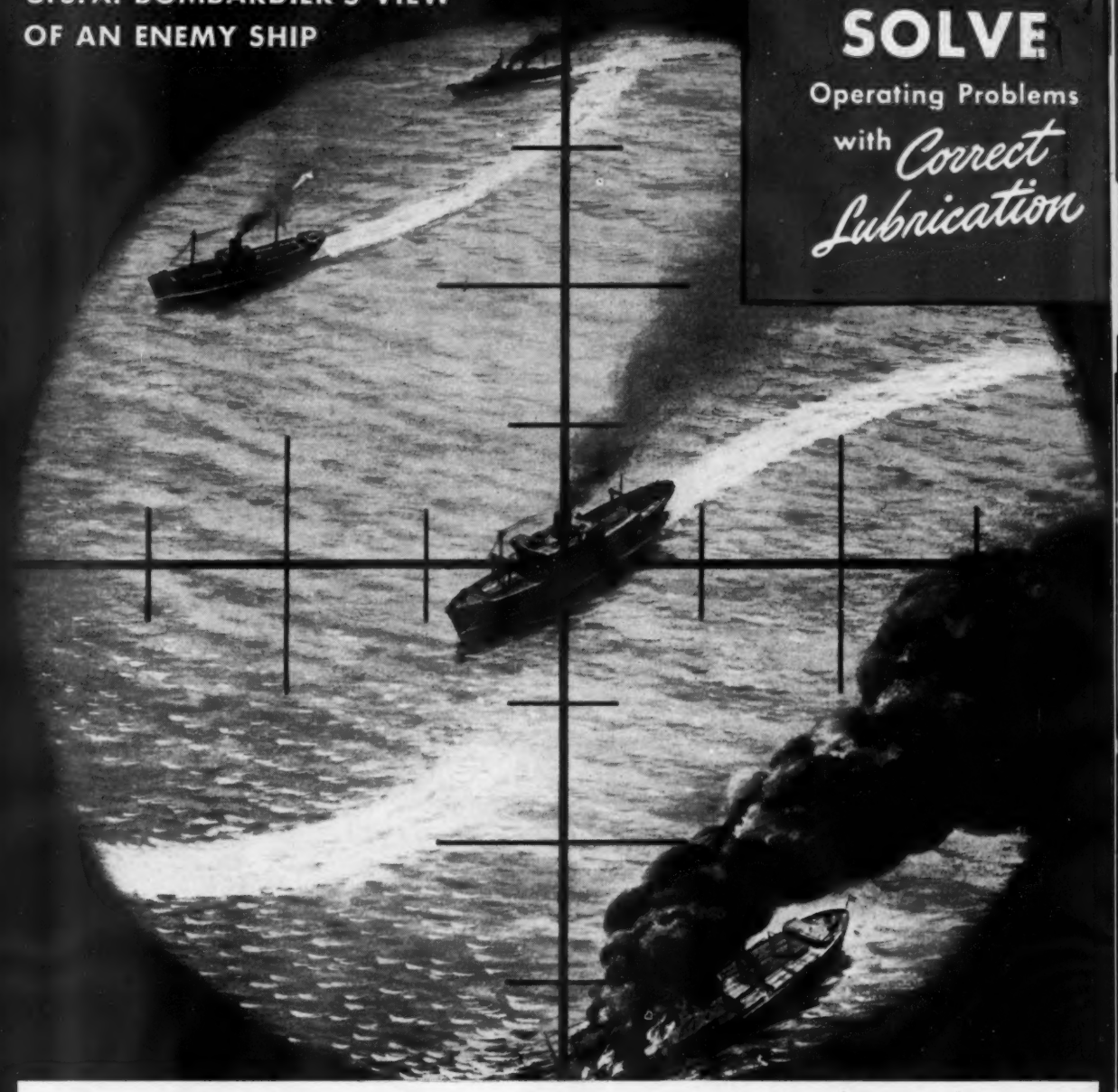
Ten Ton 54" Stroke Duplex Surface Broaching Machine

FOOTBURT *Surface* BROACHING

MOVE UP THE SCHEDULE ★ WIN THE WAR QUICKER

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

U.S.A. BOMBARDIER'S VIEW OF AN ENEMY SHIP



HOW TO SOLVE Operating Problems with *Correct Lubrication*

Let Bombsights Help You Choose Your Cutting Fluids!

A LEADING MAKER *of U.S.A.'s bombsight uses Socony-Vacuum Cutting and Soluble Oils on all cutting operations.*

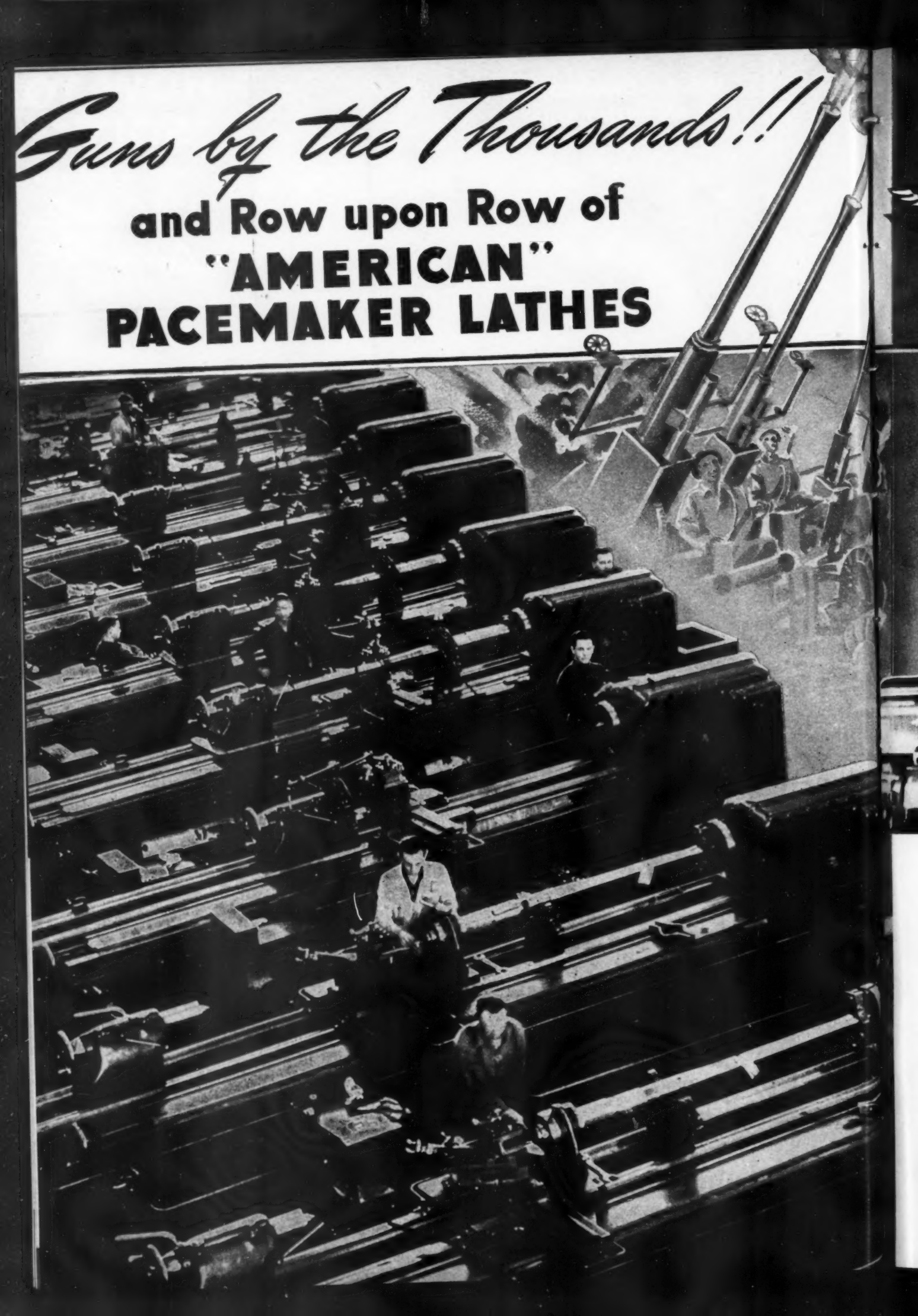
When it comes to combining need for production with need for precision, it would be hard to find a tougher job than making finely machined American bombsights.

The fact that Socony-Vacuum Cutting Fluids are used on tough alloy steels in this job is an important indication of the performance you can expect from these high quality products. Use them to secure fast-cutting, long tool life, superior finish, maximum production.

SOCONY-VACUUM OIL CO., INC.— Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of Calif.

SOCONY-VACUUM Lubricants

CALL IN SOCONY-VACUUM


Guns by the Thousands!!
and Row upon Row of
"AMERICAN"
PACEMAKER LATHES

...producing them in the Plant of THE DOMINION ENGINEERING CO.

Our fighting forces need guns and more guns and they are getting them in ever increasing numbers.

In the gun plants of this country and Canada "AMERICAN" Lathes are meeting every challenge of increased schedules. They are producing as they never produced before and at the same time are maintaining amazing standards of accuracy.

For all-out production, call on "AMERICAN".

THE AMERICAN TOOL WORKS COMPANY

Lathes - Radials - Shapers

CINCINNATI, OHIO, U. S. A.

These Alcoa Aluminum permanent mold castings are on their way to some fabricator's machine shop to become airplane landing wheels. Some of them are big fellows, twenty-seven inches in diameter and weighing a hundred and twenty pounds. Complicated in shape, they are also sound in structure, suiting them to the task for which they're intended.

The Alcoa foundry that made these permanent mold castings grew up with the demand for such lighter weight and stronger parts. Mold engineering, casting techniques and alloy development, have all progressed as service requirements got tougher. And this progress continues.

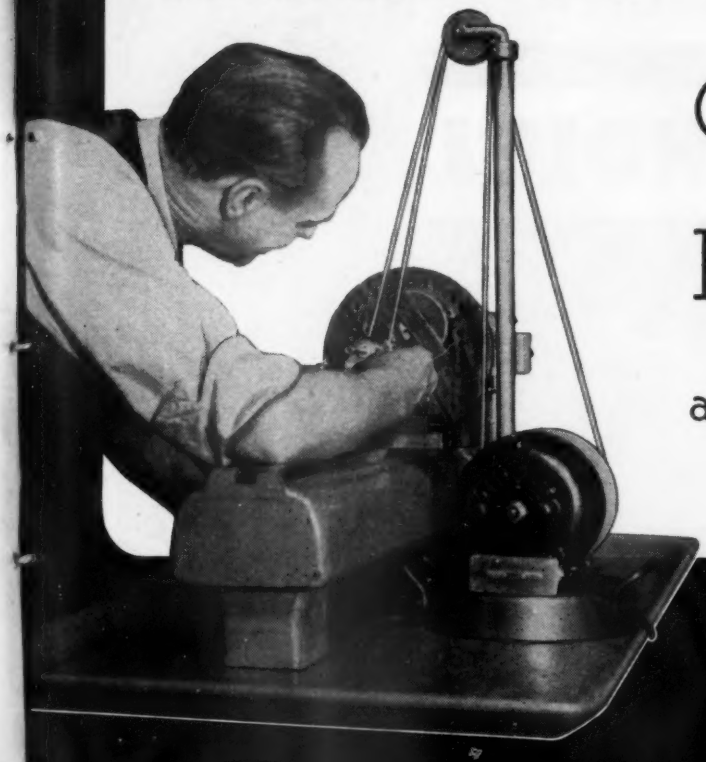
To the manufacturer who is including aluminum in postwar plans, Alcoa permanent mold castings offer many advantages. The process makes possible quantity production at moderate cost. Aluminum gives lightness, strength, resistance to corrosion and fine appearance. Alcoa castings are characterized by soundness and smooth surfaces.

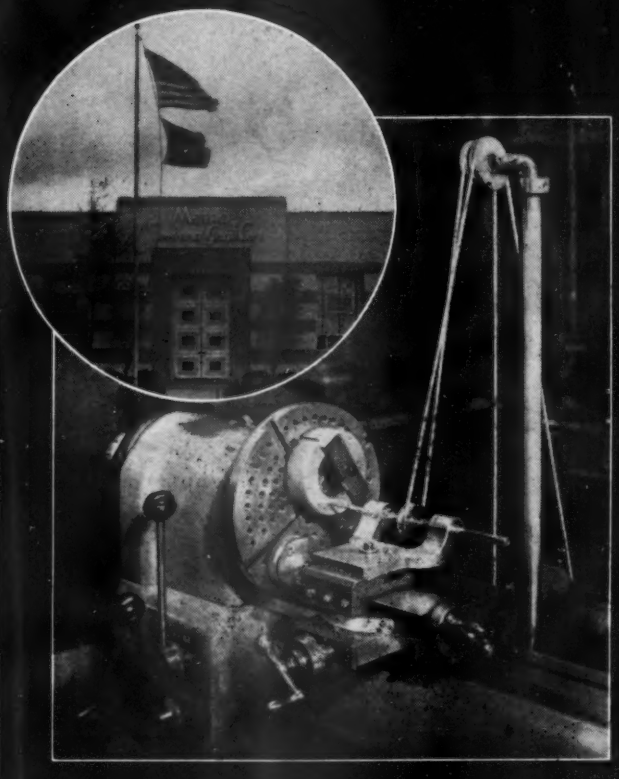
ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

HARDINGE Precision Lathe Grinding a Precision Gage

at Metro Tool and Gage Co.
Chicago, Illinois





The HARDINGE High Speed Precision Lathe is being installed in ever increasing numbers in tool and die shops in the United States and Canada because they are well suited to a wide variety of work involving the precision limits in modern manufacturing.

The sustained accuracy of the HARDINGE High Speed Precision Lathe means dependability in operation.

Write for 16 page bulletin describing this machine and other Hardinge Precision Products.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

Machine tools will also eliminate *this* kind of

FOXHOLE!

For this, too, is a scene of bitter combat. It's a foxhole-in-the-wall, in the battle for freedom from want... in the war we must win here at home.

Machine tools are the only weapons with which that war can be won. Machine tools at work! For there is scarcely a product or a man-made thing—from the simplest bed and chair to the most intricate mechanism—that is not the creation of machinery or tools that stem from a handful of *basic precision machine tools.*

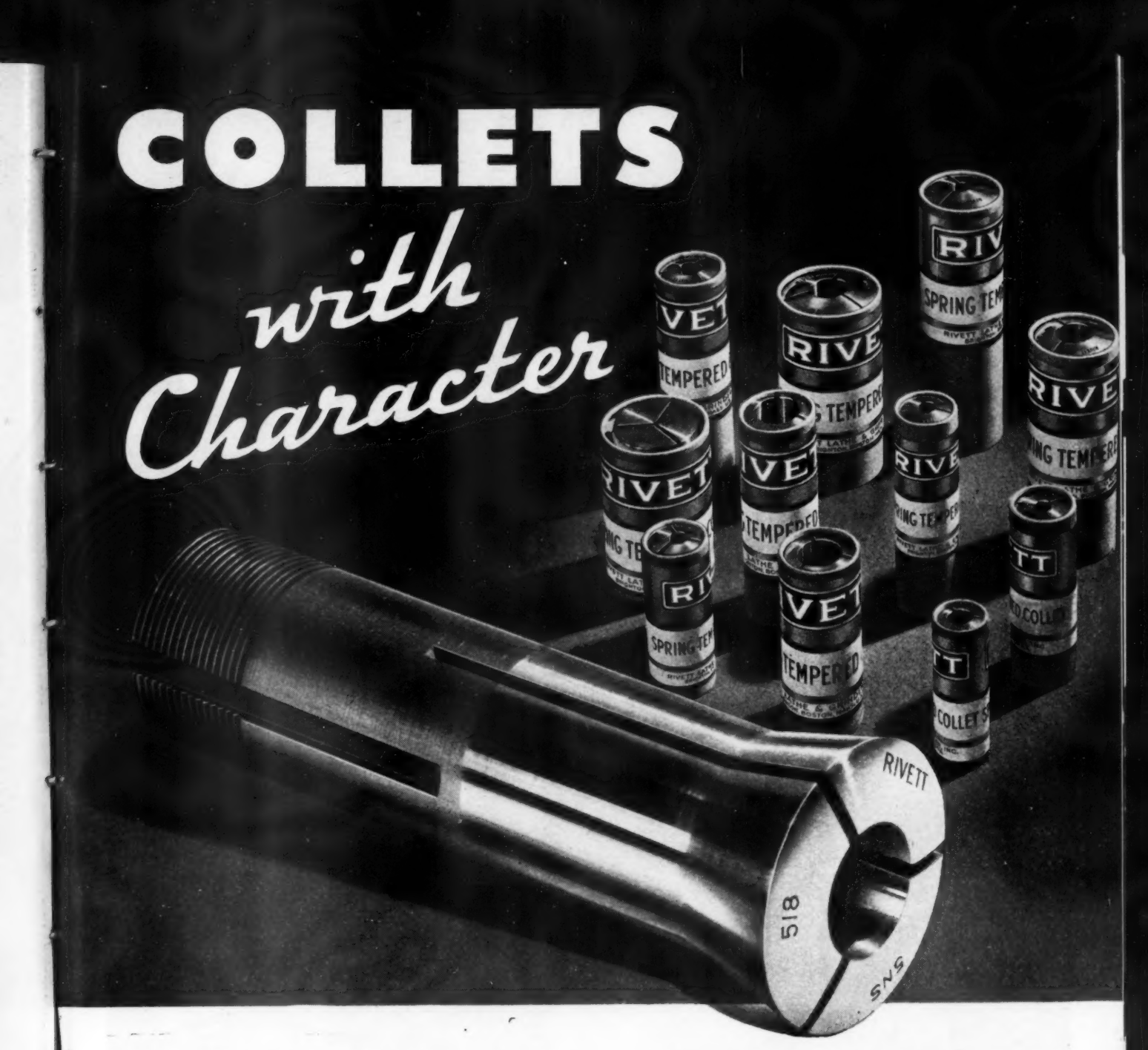
And one of these—the internal grinder—is essential to the creation of nearly every machine and tool that will make for a finer standard of living after this war.

It is because of this that the job ahead of us, here at Bryant, will continue to be a truly great one when the war is won.

Call on us!

BRYANT CHUCKING GRINDER COMPANY Springfield, Vermont, U. S. A.

COLLETS *with Character*



A RIVETT DRAW-IN COLLET has personality derived from a worthy inheritance and a steadily improved environment. Today when a RIVETT COLLET is shipped in its distinctive carton it reflects fifty years of experience and the most advanced methods in manufacture and inspection.

RIVETT DRAW-IN COLLETS are available in all standard styles for bench lathe, engine lathe, miller and grinder use. Work held in a RIVETT COLLET is guaranteed to run "dead true" at the collet mouth and within .002" two inches from the collet mouth. For complete information on all RIVETT COLLETS and their adaptation to existing machines write for Bulletin 100.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

In constant service 48 hours per week at the Gould & Eberhardt plant, Irvington, N. J.

Purchased by Gould & Eberhardt, Irvington, N. J., manufacturers of gear cutting machines and shapers, to speed up cutting-off from bar stock on various grades of steel up to 6" in diameter, this MARVEL 6A high speed Production Saw has been operating 48 hours per week since installation over a year ago. When photographed it was automatically cutting identical lengths from "Maxwell" No. 3½ hot rolled natural steel 2⅝" diameter. The actual cutting time per piece, using a 6 tooth MARVEL High-Speed-Edge Hack Saw Blade, was 1 minute 15 seconds.

ARMSTRONG-BLUM MANUFACTURING CO.

"The Hack Saw People"

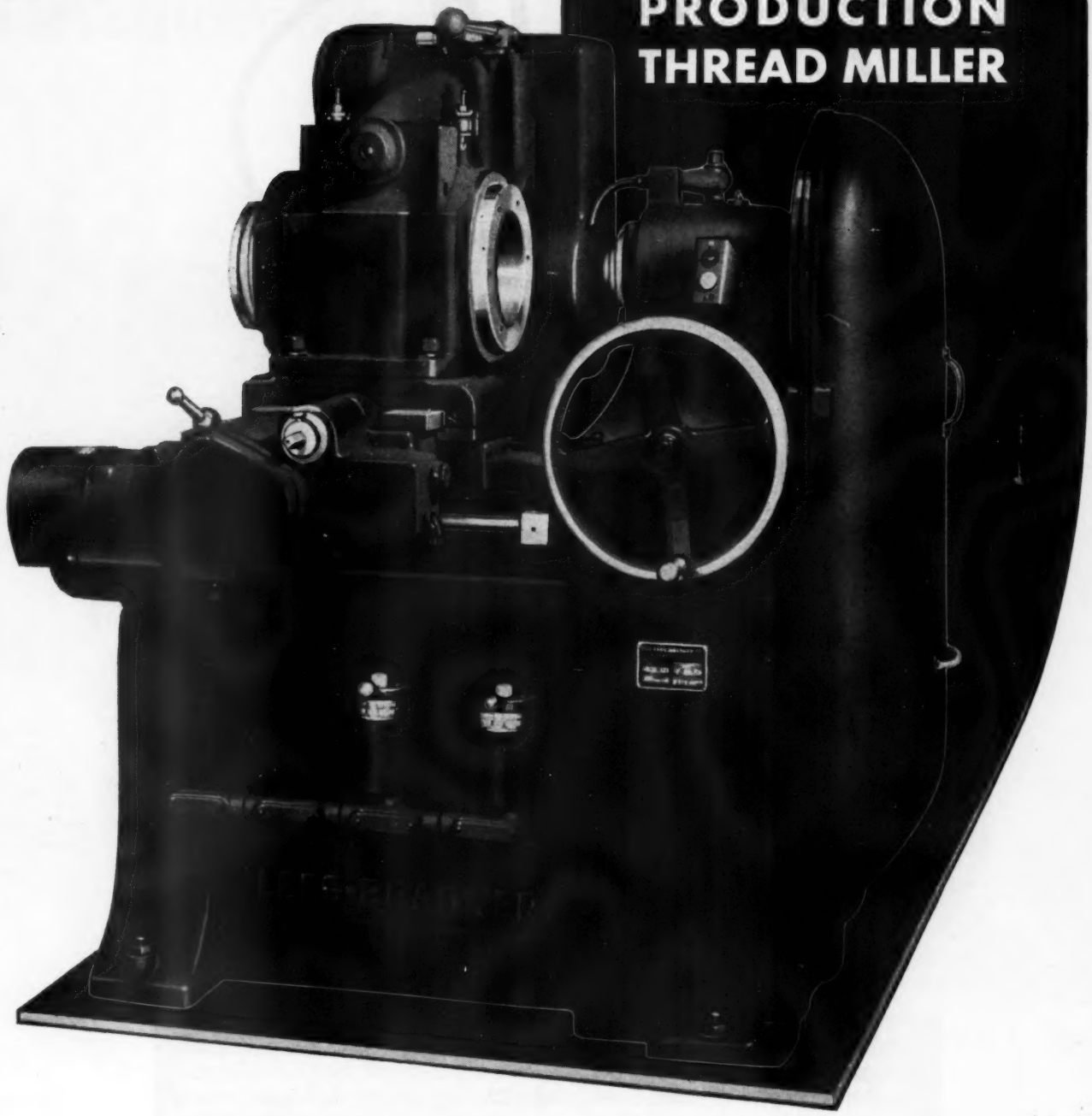
5700 BLOOMINGDALE AVENUE CHICAGO, U. S. A.

Eastern Warehouse and Sales: 225 Lafayette St., New York, N. Y.

MARVEL SAWS

LEES-BRADNER

Model 40
PRODUCTION THREAD MILLER



● Here in short is a compact, high production Thread Miller for the generation of threads by the ring or hob type thread milling process —whereby a thread is generated in but one and a fraction revolutions of the piece. ● Designed, developed and built by an organization long familiar with the need for precision threads on a mass production basis, the No. 40 can help solve your threading problem. ● Why not let an LB Engineer show you how this highly productive tool can help you generate precision threads.

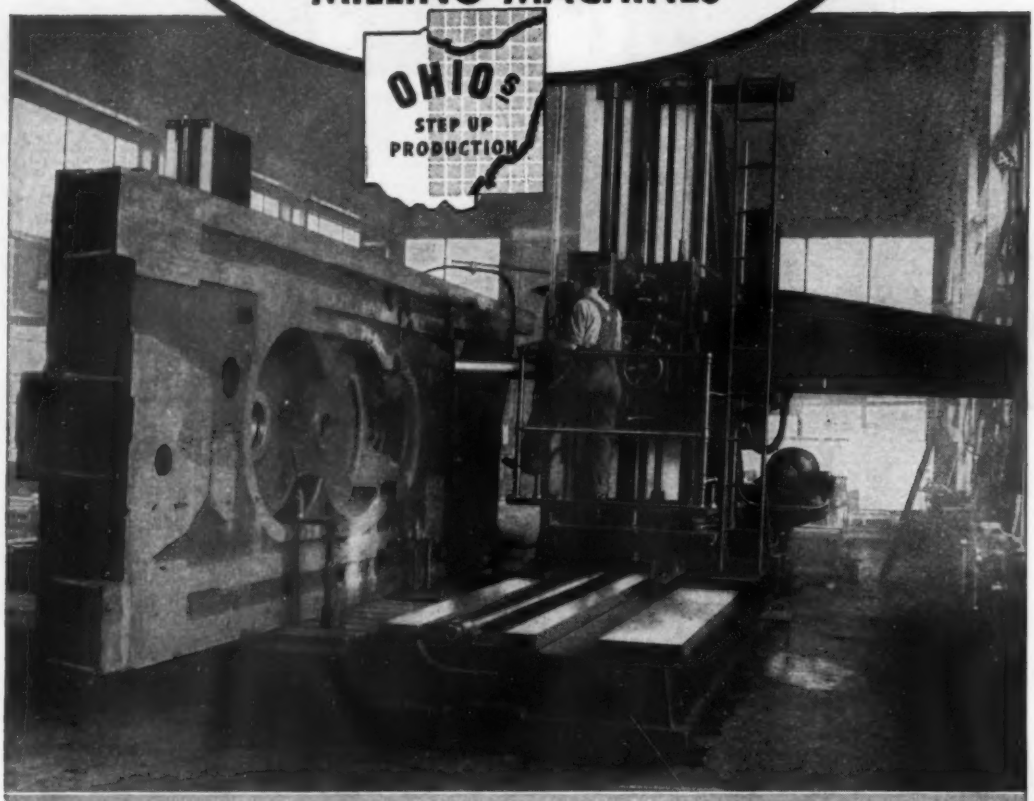
The **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO, U.S.A.

Orders for Ohio Horizontals are being shipped with reasonable promptness.

OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES



This big Ohio Horizontal handled all the boring, drilling and milling operations on a 22000-pound cast steel base for a power shovel. Performance was accurate, speedy and completely satisfactory.

Ohio's portable control (which can be ordered for the machine shown above) is a demonstrated time-saver, simplifying and speeding up many an otherwise unprofitable job. The power, precision and convenience traditional in Ohio Dreadnaughts are promoted by such features as these: unit construction, nitrided spindle, anti-friction bearings, built-in electrical power rapid traverse, narrow guide construction for all moving parts, push-button control for start-stop, forward-reverse and run-jog of the spindle, continuous spindle feed of 72" with full-length spindle support, internal gear-tooth type clutches, automatic lubrication, multiple-splined shafts with splines milled from the solid for all sliding gears and clutches.

Heavy duty and extra heavy duty models, floor and table types, 5" and 6" spindle sizes. Full range of accessories. Ask for Bulletin 300.

THE OHIO MACHINE TOOL COMPANY • KENTON, OHIO

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

WHEN SUB-CONTRACTING DEPENDS ON FINE LIMITS

attery of Vertical urret Lathes ma- ining steel crank- ses for Wright yclone 14 cyl. air- raft engine in lant of a subcon- ctor of Wright ronautical Corp. he steel forging A.M.S. 6382, at treated to rinell 241 to 285.

YOU'LL DO WELL WITH "BULLARDS" ON THE JOB

Here is what these V.T.L.s do.
Note the close tolerances required.

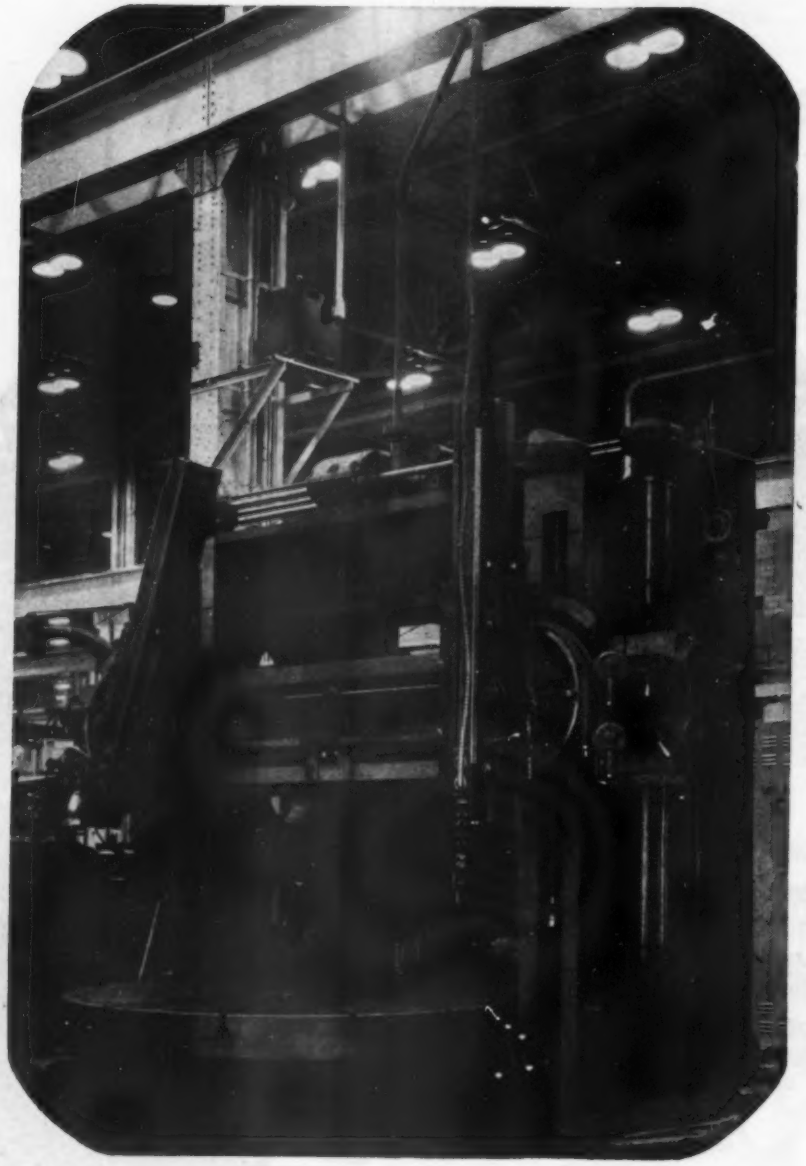
THE Axis-crushing volume of America's airplane production would not, of course, be possible were it not for widespread sub-contracting. That, in turn, depends upon machines that work rapidly, to fine tolerances you can rely on.

There is scarcely an airplane maker or sub-contractor without its quota of Bullard V.T.L.s. The V.T.L.'s two heads cutting at the same time make for speed; its rigid vertical construction insures accuracy. These same qualities will lower the cost of the varied things we shall need after the war planes have done their job.

- Turn flange, 23" diameter — *limit + or —.001".*
- Turn collar.
- Face flange.
- Bore and chamfer flange I.D.
- Form 19" counterbore, depth ¼"—*limit + or —.001".*
- Turn O.D. of central boss— *limit + or —.002".*
- Bore boss—*limit + or —.0005".*

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT



KING

● Illustrated is a comparatively recent installation of a King Boring Machine in the plant of one of America's leading electrical manufacturers. This is one of several King Vertical Boring and Turning machines located at this plant —which are handling quickly and accurately a wide variety of precision boring — turning and facing operations.

King Boring Mills provide sixteen mechanical speed changes — twelve feeds — power rapid traverse to each head — automatic lubrication to complete drive, table and spindle from reservoir in base. Machine shown is also equipped with electric pendant switch to facilitate operation of rams and saddles on cross rail.

King Builds Vertical Boring and Turning Machines exclusively — single column types from 30" to 42", double column types up to 10 feet.

Ready for
ACTION

KING

VERTICAL BORING AND TURNING MACHINE

The KING MACHINE TOOL *Company*

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO

DEPENDABLE PRECISION

A Thompson Advantage

• Thompson Grinders are used extensively in machine tool plants for precision grinding of all kinds from small parts from unit assemblies to the machine ways of large machines. Illustrated is a Type C Thompson Grinder operating in the plant of a prominent lathe manufacturer.

The smooth, shockless hydraulic operation of both the wheel head and table provides particularly close tolerances and smooth finish on all jobs.

The machine illustrated is equipped with the Thompson automatic wheel truing unit. This stationary truer provides instant availability of the truing tool and all wheel heads are now furnished with hydraulic wheel truing feeds. It is not necessary to disturb work in order to true the wheel.

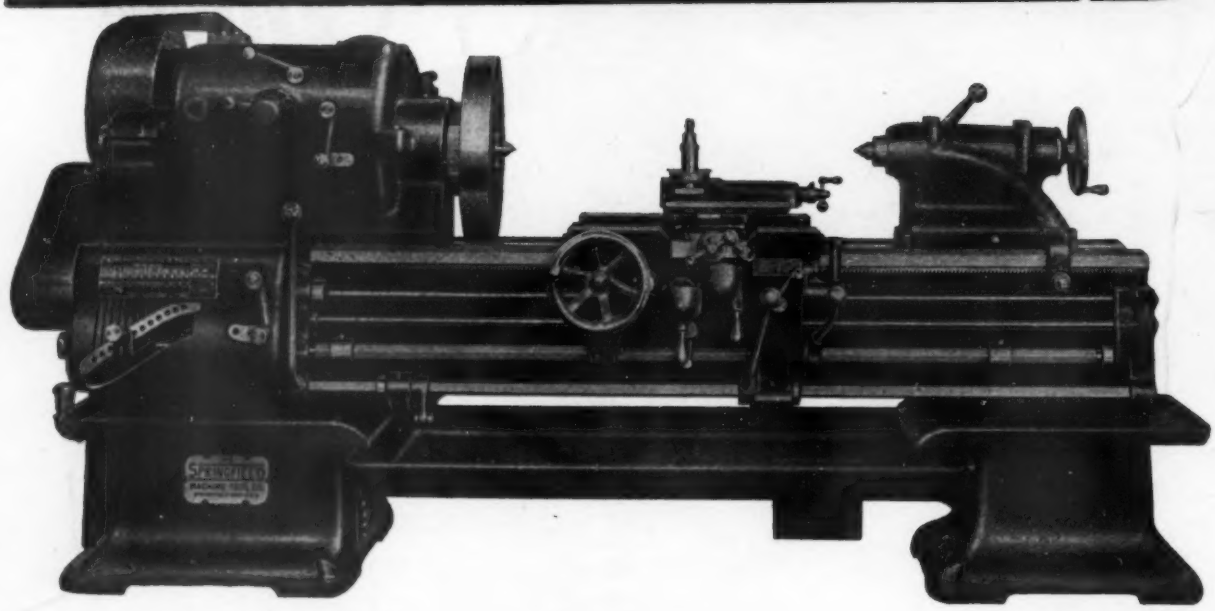
These are but a few of the many advantages provided in Thompson Hydraulic Grinders that make for accuracy—smooth finish—and longer life. Try a Thompson on your next precision grinding job.

Thompson Grinders are made in a full range of types and sizes from the Tool Room Grinder with a 6″ x 18″ capacity up to the largest Type C 36″ x 36″ x 240″.

THE **Thompson** GRINDER CO.

SPRINGFIELD, OHIO

Choose SPRINGFIELD



GEARED HEAD LATHES

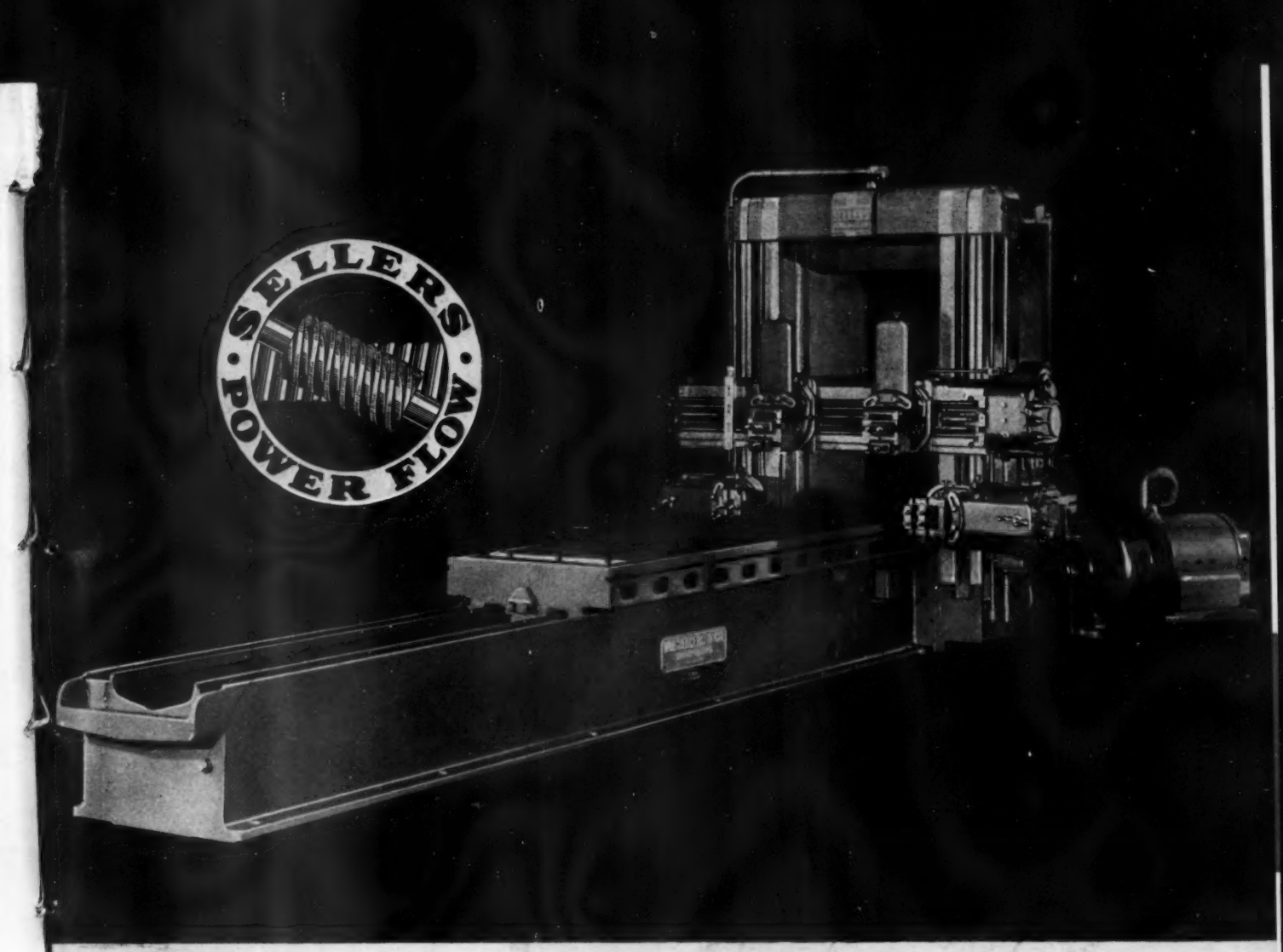
Many are the problems that face industry today, no small one being that of increasing production for war purposes. In this respect, you'll find it to your advantage to choose SPRINGFIELD Geared Head Lathes.

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELDS can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions, make it SPRINGFIELD Geared Head Lathes . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.



RUGGED AS THE PIONEERS WHO WON THE WEST

And like the woodsman's renowned skill with his Kentucky rifle, the Sellers **Power-Flow Planer** matches its ruggedness with extreme ACCURACY—an accuracy seldom encountered in a machine tool of such size and capacity.

When production schedules are "impossible" and tolerances rigidly close you can bank on the Power-Flow for fast, continuous, ultra-precise work . . . Nearly a century of "Precisioneering" on machine tools exclusively are behind it.

If higher output at lower cost is your responsibility write for the new Power-Flow catalog which will acquaint you fully with the design and operating principles of this unusual machine . . . Wm. Sellers & Company, 1610 Hamilton St., Philadelphia, U. S. A.

© 1943, Wm. Sellers & Co.

SELLERS PRECISIONEERING SINCE 1848

BE FIRST ON THE

POST-WAR PRIORITY LIST FOR SOUTH BEND LATHES

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swings, with bed lengths from 3′ to 12′. The Turret Lathes are made with 9″ and 10″ swings. They are fully illustrated and described in Catalog No. 100-C.

Post-war employment and prosperity depend upon quick resumption of normal peace time civilian activities, production, and services. To furnish lathes first to those who will be ready to use them (but cannot qualify for a war-time priority) South Bend Lathe Works now offers a practical post-war priority plan.

To take advantage of this plan, place an order now for the lathes you want. No down payment, no deposit is required. Should conditions necessitate, you may cancel the order at any time. All we ask is that it be placed in good faith.

When your order is received, we will issue a numbered Post-war Priority Certificate. As soon as materials and manpower are released for civilian production, South Bend Lathes will be shipped in accordance with the Priority Certificates. Certificate holders will receive the first South Bend Lathes to be thus released, up to 80% of our production. The remaining 20% will be reserved for returning service men who may need lathes.

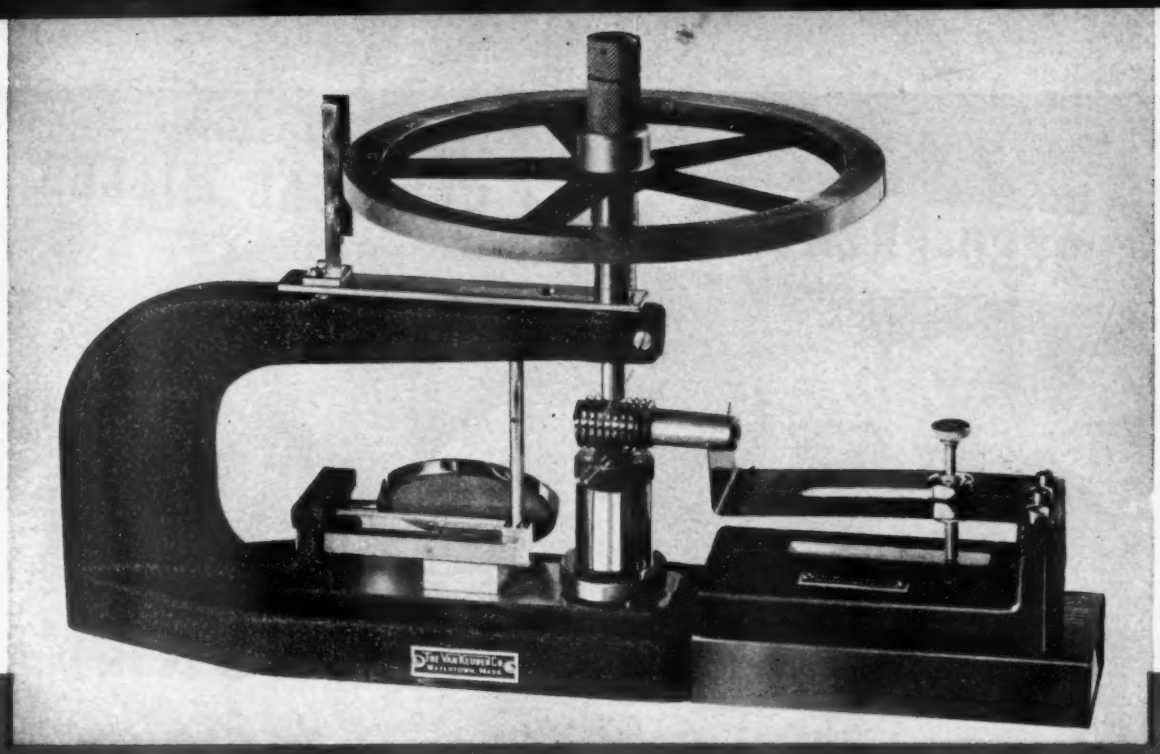
All standard South Bend Lathes, embodying the improvements developed in meeting exacting war production needs, will be available. No revolutionary models or design changes are to be expected. There will be no price increase—unless material or labor costs, or other conditions beyond our control, require it.

Here is a practical first step in putting your post-war plans into action. Send for Catalog No. 100-C and full information on this plan. Choose the lathes that meet your needs... place an order now, and be sure of earliest possible delivery.

Buy War Bonds Now...Save for Lathes

SOUTH BEND LATHE WORKS

SOUTH BEND 22, INDIANA **LATHE BUILDERS FOR 37 YEARS**



Van Keuren LIGHT WAVE MICROMETER FOR SUSTAINED ACCURACY

New System of Accuracy — The VK light wave micrometer is an instrument which has formed the basis for an entirely new method of maintaining high standards of accuracy. No gage blocks are required. Errors from worn gage blocks will not be constantly duplicated in the product.

A calibration chart showing the micrometer screw corrections to .00001" is furnished with each instrument. The new type of hardened and ground precision micrometer screw actually improves with use. Fine workmanship and carboloy wearing surfaces make the instrument accurate and dependable for years of constant service.

Controlled Pressure Assures Uniformity — By using the sensitivity of light waves the VK light wave micrometer insures the exact duplication of measuring pressure by any operator. This controlled pressure feature makes it possible to measure hard or soft materials, and for readings to be duplicated by different operators to .00001".

Ideal for Shop Measurements — The VK light wave micrometer is ideal for making measurements by the 3 wire method, for measuring plug gages, measuring wires, precision parts and shop standards. It is a reference instrument. Forget about comparative measurements with gage blocks —use the VK light wave micrometer.

It is fast, accurate and profitable.

The VK Light Wave Micrometer is described in full in our manual of precision measuring equipment. This book also gives complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Write for your copy!

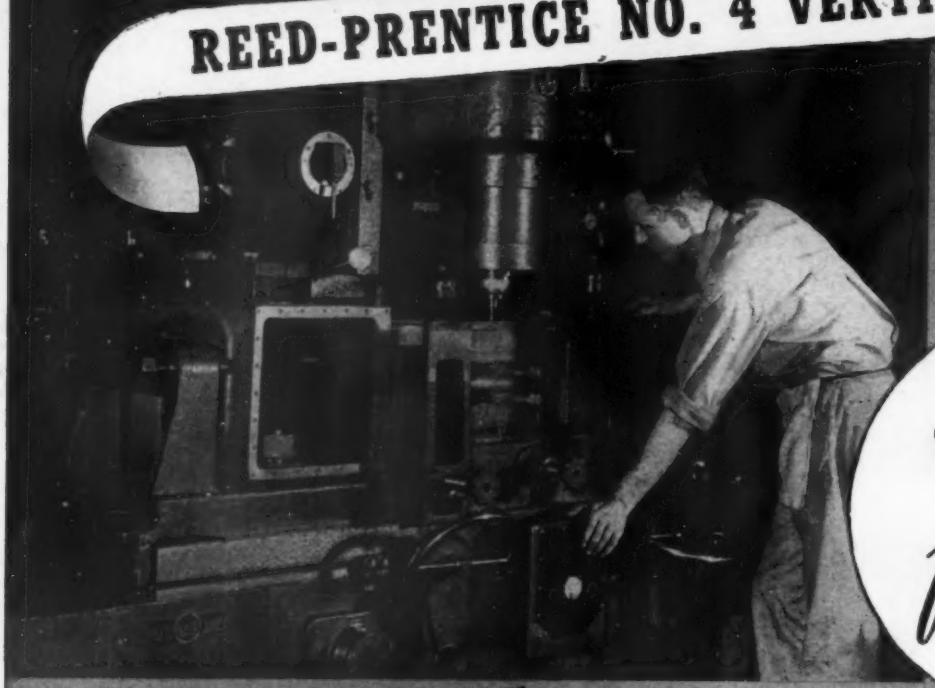
Van Keuren

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

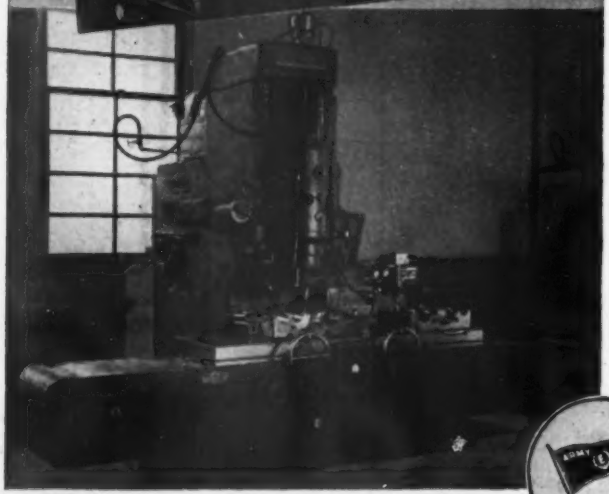
24th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

REED-PRENTICE NO. 4 VERTICAL MILLER



AT WORK *for Victory*



Reed-Prentice No. 4 Vertical Millers are more than fulfilling the expected demands on their performance and versatility. Of particularly rugged construction, and with exceptionally large working surface of table, 24" x 84", this machine is proving extremely efficient due to many features, including centralized controls, infinitely variable feeds, transmission of power to table and cross slide through hydraulically actuated screws, power down feed control through electronic unit. Experienced operators prefer the Reed-Prentice No. 4.

★ ★ ★

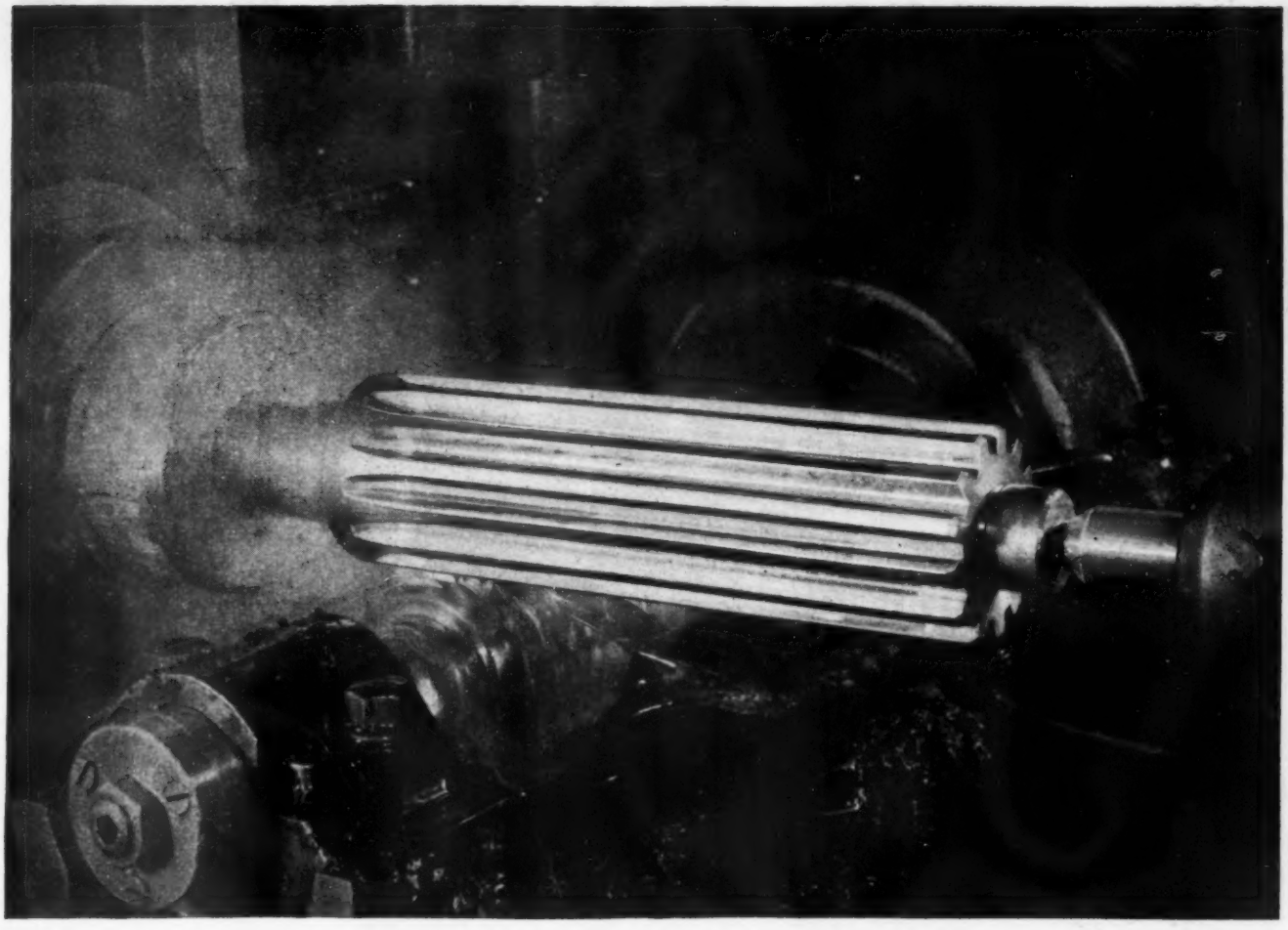
Reed-Prentice No. 4 Vertical Miller shown in the plant of a prominent pre-war automobile manufacturer is equipped with duplicating attachment for "rush" war production. Other No. 4 Millers are in use for milling gun mounts, tank parts, gun breach blocks, aircraft parts.

Many drop forge plants are using this machine for die sinking.

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland. Ohio
75 West St.
New York City. N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.



AS A RESULT OF CHANGING THE CUTTING OIL, CUSTOMER REPORTS 50% MORE PIECES PER HOB

THIS specific example of How To Conserve Cutting Tool Life has recently come to our notice. On two spline hobbing jobs in a transmission plant, the number of pieces per hob sharpening increased 50% *as a result of changing the cutting oil.* Thus, with the same number of sharpenings, each hob produced half again as many pieces as before, and there was a proportionate saving in set-up time as well. On one 10-key piece with splines 6¼" long and 2½" diameter, pieces per grind increased from 16 to 24; on the other 10-key piece with splines 2½" long and 1⅞" diameter, pieces per grind increased from 24 to 36!.. This is not saying that every job can be improved as much by the same method. But we do know there are many instances where a change of cutting oil might produce a substantial gain. Consult your cutting oil supplier — give him the facts, and give his recommendations a good trial. If you *do* make a saving, you are helping just that much toward conservation of vital cutting tools, and toward relieving the overload on cutting tool manufacturing facilities. *Your hobs are weapons — get the most out of them!*

CONSULT YOUR CUTTING OIL SUPPLIER...

He is equipped with specialized knowledge of what oil will get the best results. He is ready and willing to help in any way he can. *Give him a call!*

Buy War Bonds

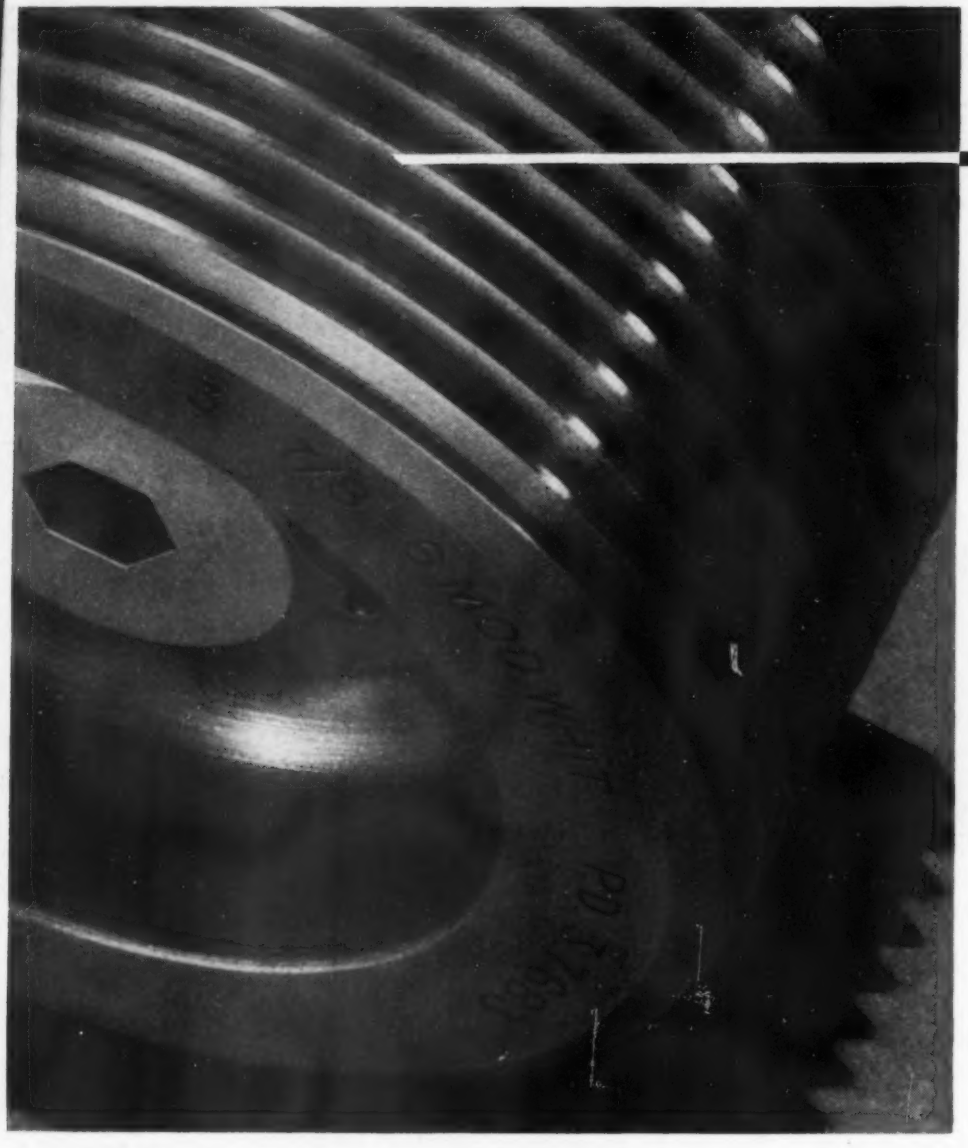
BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

THROUGH ALL THE RUSH



Pratt & Whitney thread gages in every style and size, such as the one shown here, are meeting the demands of war-time rush with pre-war dependability. The same careful precision lapping of these threads continues in our factory . . . the same skilled hands and machines bring each gage to accurate size. Some customers have entirely eliminated their own inspection of new P&W thread gages . . . an expression of their complete confidence that we will continuously strive to merit. Pratt & Whitney thread gage accuracy has been proved over and over again in war production.

One Name Still Holds Its Meaning

SYNONYMOUS with "dependable accuracy," the P&W name has lost no shade of its pre-war meaning. Now as then, Pratt & Whitney gages go forth to serve with unimpaired precision. A rock upon which industry can count in difficult production problems, P&W machine tools, small tools and gages remain true to their name and reputation.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD, CONNECTICUT, U. S. A.

STAY "ON THE LEVEL"

WITH THE BOYS AT THE FRONT

MAKE IT FIT TO FIGHT

ACCURACY DEMANDS...

KEEP YOUR TURRET LATHES LEVEL

Use only a precision level, or the cutting test for leveling your machine • *CONSULT YOUR SERVICE MANUAL*

★ *Reproductions of this page on enameled paper are available for bulletin-board use in your turret lathe department. Write the Gisholt Machine Company, 1201 East Washington Avenue, Madison, Wisconsin. Ask for the series of "War-time Care and Operation Posters." State quantity required.*

You Get WIDE SPEED

Data from a few actual installations

SPEED RATIO	RPM	APPLICATION	RESULTS
100 : 1	50 to 5000	Drive for magneto testing	Faster and more accurate testing
100 : 1	30 to 3000	Drive for material-testing machine	Constantly increasing rate of tension maintained until material breaks
25 : 1	100 to 2500	Lathe-headstock drive	Increased cutting range and fewer gear changes
20 : 1	85 to 1700	Spar-mill drive	Greatly increased output
3 : 1	1000 to 3000	Drive for machine used to test airplane-propeller governors	More complete test data, as well as speed and precision of testing

NOTE: Likewise, the speed range of Thy-mo-trol drive can be built to suit the requirements of your application. May we discuss your requirements?

THY-MO-TROL DRIVE

Where Else Can It Be Applied? Drill presses, to increase speed range and the number of kinds of work handled. Grinders, for precise speed selection and improved finishing. Milling machines, to increase variety of work handled and to simplify design. Cable reelers, to maintain constant tension. Conveyors, to match speeds. Also, automatic arc-welder carriages, weld positioners, pumps, boring mills, automatic screw machines, thread-milling machines, tube-forming machines, alternator speed control, paper and cellophane reels, shell lathes, and numerous other applications.

RANGE *and more*

with THY-MO-TROL DRIVE

A-C POWER

D-C MOTOR

IT gives you speed ratios even greater than 100:1. This new electronic equipment makes available the full, wide speed range of d-c motors—*on a-c* power!

Just a single dial provides this smooth, automatic, full-range control. A single dial—small as a radio volume control, and mounted in the push-button control station—gives complete adjustment of motor speed, from zero to maximum. Thus, you can easily and quickly obtain the exact speed you want, whether, it be for roughing or fine finishing.

Here Are Six OTHER Advantages:

1. Stepless speed control
2. Constant speed under changing load
3. Smooth, fast, constant-current acceleration
4. Low maintenance
5. Speed can be preset before starting
6. No stop for speed change

A Complete Drive

Thy-mo-trol drive takes a-c power from your supply line and, through its d-c motor, delivers torque to your load over a wide range of speeds. Starts, accelerates, controls speed, stops by dynamic braking, and reverses the motor—all from a single, compact control station.

How to Buy Thy-Mo-Trol Drive

Standard Thy-Mo-Trol drives can be obtained in ratings from fractional-horsepower sizes up to 10 hp; higher ratings can also be provided.

This electronic motor control makes possible improved machine design, performance, and operating technique. In order to be sure that you get the full advantage of this new drive, G-E engineers want to consider each application as an individual case. We suggest you get in touch with our local office, giving complete information about your machine for which the drive is required. General Electric, Schenectady, New York.

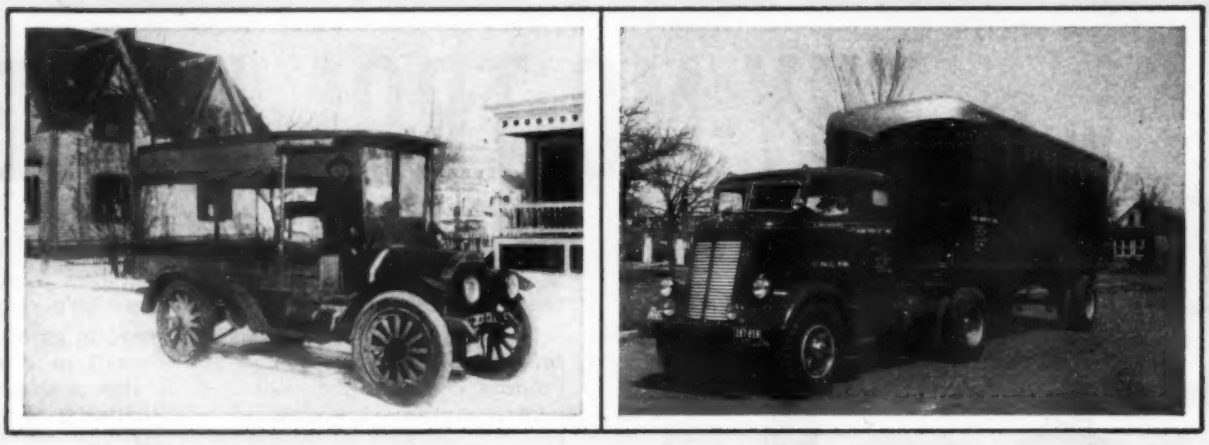
BUY WAR BONDS

ANOTHER G-E "FIRST" IN INDUSTRIAL ELECTRONICS

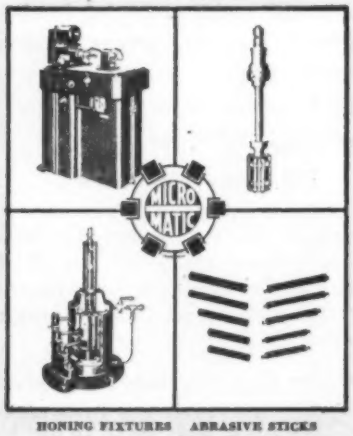
GENERAL ELECTRIC

876-104-8050

Honing *shared in converting yesterday's "PRIDE OF THE FLEET" into the* MODERN ECONOMICAL TRUCK CARRIER



HONING MACHINES — HONING TOOLS



HONING FIXTURES — ABRASIVE STICKS

Yesterday—*Called "slave ships" and "kidney busters" by drivers, yesterday's trucks were hard to drive, costly to operate, and required almost constant service. But with all their crudities, they inaugurated a new era in highway transportation and distribution of goods. Grinding—an early process of controlled abrading—made them possible.*

Today—The powerful modern carrier has higher speed, maximum economy, long periods between overhauls, easy maintenance, a high pay-load factor—the goal of yesterday's builders. HONING, the modern, controlled abrading process, helped engineering design and production achieve this mechanical triumph.

Tomorrow—Today's tough military service and maintenance will be projected rapidly into commercial and industrial use. The competitive movement of bulk-weight shipments will require greater and greater operating efficiency.

In the mechanical refinements to come, HONE ABRADING processes developed by Micromatic will be ready to play a most important part.

MICROMATIC

HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

Army Transport Now Races On Honed Working Surfaces

Only yesterday army trucks crawled briefly between breakdowns—because of poor bearing surfaces. Modern carriers—trucks, tankers and prime movers have to be tough to stand the continuous service under heavy going.

They now race dependably on accurately honed working surfaces. Speed and time between overhaul have been multiplied. They are better because of their precision bearing surfaces. Honing assures this surface quality, and eliminates loose bearings, inaccurate fits, fatigue cracks, and other enemies of durability.

Microhoning—the modern abrading process—removes stock at rates up to 65 cubic inches per hour—generates accuracy for roundness and straightness of bore within .0002″ to .0003″ and any desired surface finish.

Trucks — planes — tanks — jeeps — ordnance — ships — Microhoning has many applications in war . . . and many more in peacetime use. Write for Bulletin A. R. 67.

Some Microhoned Heavy Vehicle Bores

Gas and Diesel Engine Cylinder Bores and Sleeves

Connecting Rod Bores (Large End)

Valve Guide Bores

Diesel Fuel Injector Bores

Shock Absorber Bores

Brake Cylinder Bores

Transmission Gear Bores

Ditching Machine Planet Gear Bores

Roller Tooth Steering Sectors and many other parts.

MICRO MATIC

Courtesy Mack Truck

MICROMATIC HONE CORPORATION

DETROIT, MICHIGAN

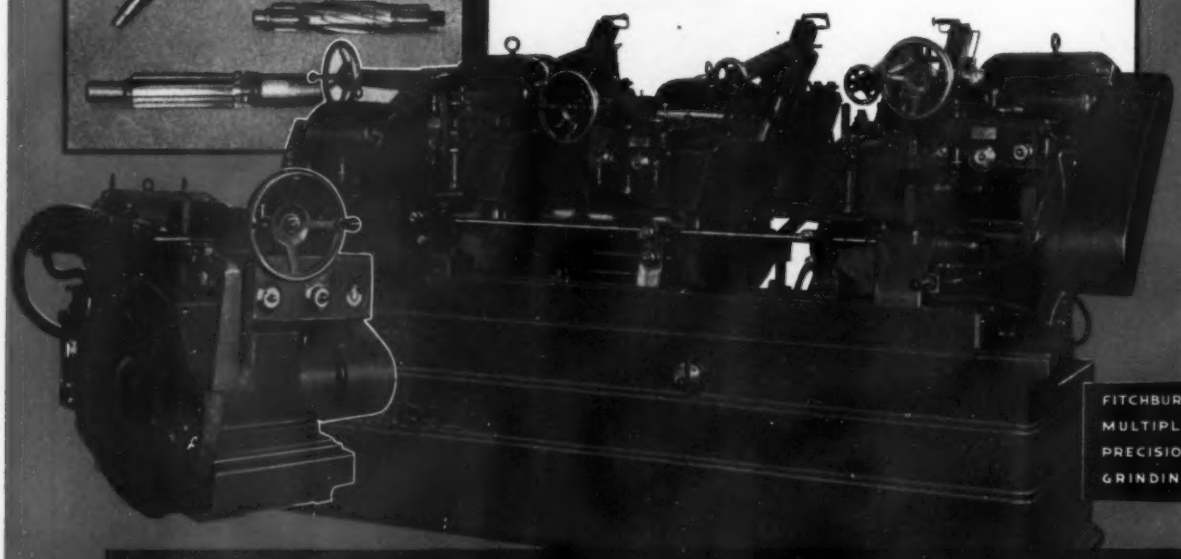
THE FITCHBURG METHOD OFFERS . . . SPECIAL MACHINES FROM STANDARD UNITS

Fitchburg automatic multiple precision grinding offers the same profit possibilities that up-to-date shops now earn with multiple tooling and combined cutting on machined work.

Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordinance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.



FITCHBURG MULTIPLE PRECISION GRINDING

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders

Machining today's swords AND TOMORROW'S PLOWSHARES

Accurate machining of large irregular contours, be they armament products or peacetime ship propellers, has always presented a difficult problem. Such castings usually require hand finishing, chipping and grinding, or some alternate laborious process. Not only are valuable man-hours tied up —but the finished workpiece, more often than not, deviates from the tolerances specified for the theoretically correct contour.

Standard milling machines are limited in the size of workpiece they will accommodate, and duplicating machines have much the same limitations.

A Westinghouse-developed device for more accurate firing of guns in motion provided the solution to the problem. Using the principles of this device, an electrically-controlled tracer mechanism follows the contours of a scale-model jig and guides the contour milling machine cutters on the workpiece surfaces. The model may be accurately formed of wood, plastic, metal or any other material. Thus, large irregular surfaces may be reproduced in any desired quantity, working within tolerances of a few thousandths, and in a fraction of the time required for the less accurate hand methods.

THE MACHINE IN MACHINE TOOLS

Westinghouse engineers often are called upon to supply electrical solutions to the complex mechanical problems of the nation's leading machine tool builders. This consulting service is yours for the asking. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. J-94572

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Official U. S. Army Signal Corps Photograph

BRIDGEHEAD ABROAD demands efficiency at home. For increased production in *MACHINING* use . . .

. . . SINCLAIR CUTTING OILS and COOLANTS. They promote high precision at top cutting speeds . . . finer finish and reduced cost per piece machined. Sinclair provides a diversified line of specialized oils adapted to every problem.

(Write for "The Service Factor"—published periodically and devoted to the solution of lubricating problems.)

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY (INC.), 630 FIFTH AVENUE, NEW YORK 20, N. Y.

GIVING IMPETUS TO BOMBER PRODUCTION

FOSDICK
JIG BORERS

● This Fosdick Jig Borer is drilling and boring precision holes in a drill fixture to be used to aid the mass production of heavy bombers.

On this job five operations are performed — machine has just completed drilling and boring hole .3125" diameter in machine steel piece.

The rigidity — flexibility — and ease of operation makes the Fosdick Jig Borer an ideal machine for precision drilling — boring and facing operations on close tolerance tool and fixture work. The hundreds of Fosdick Jig Borers now operating in Tool & Die Shops are evidence of their ability to meet the accurate demands of both war and peace time production.

Put your precision drilling and boring on a Fosdick Jig Borer. *Our fully descriptive Jig Borer bulletin J.B.A. is quickly available. Write for yours.*

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- **Production**
- **Adaptability**
- **Fixture Saving**
- **Operation Saving**
- **Material Saving**
- **Fine Finish**
- **Flatness**
- **Close Limits**

. . . . . *Especially valuable on jobs like the one illustrated.*

Grinding Steel Forged Rocker Arms on No. 11 Blanchard Surface Grinder

These steel forged Rocker Arms are ground on a No. 11 Blanchard Surface Grinder, with speed and economy.

Twenty pieces are loaded on a special Blanchard designed fixture. .005" of stock is removed from one side.

1800-2000 pieces are produced per eight hour shift.

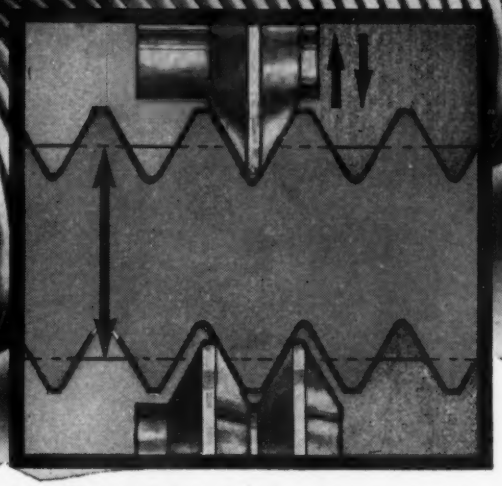
BLANCHARD

The BLANCHARD
MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS.

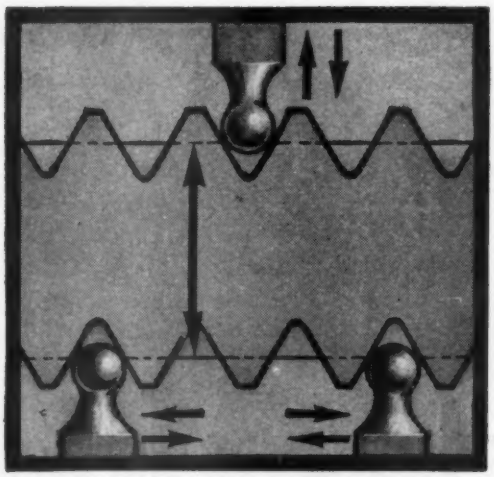
Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

A Faster Way to Inspect PITCH DIAMETERS

Positively, More Accurately and to closer tolerances



MODEL 45B-100. The upper, sensitive roller contact actuates the Dial Indicator.



MODEL 45B-80. The upper, sensitive ball contact actuates the Dial Indicator. Both lower ball anvils float sidewise independently to compensate for any variation in lead.

No conventional type of gage, whether ring gage or roller-type snap gage, can tell you so **definitely** and so **quickly** the degree of accuracy of a pitch diameter as these two types of Dial Indicator Gages. Neither depend upon the uncertain sense of touch.

The roller type tells more than the conventional roller snap gage because the sensitive upper roller contact, reveals on the Indicator, just **how much** and **where** the pitch diameter may be wrong. The ball type simulates the three-wire method, but is faster. It is accurate to a tenth of a thousandth. Either type is incorporated in the adjustable Dial Indicator Gage shown below. For details write—

TWO FULL COLOR FILMS
(With Sound)
No. 1 DIAL INDICATORS
No. 2 DIAL INDICATOR GAGES
20 minutes each. For instruction and training.
For showing write ⟶

FEDERAL PRODUCTS CORPORATION
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ARMY E NAVY

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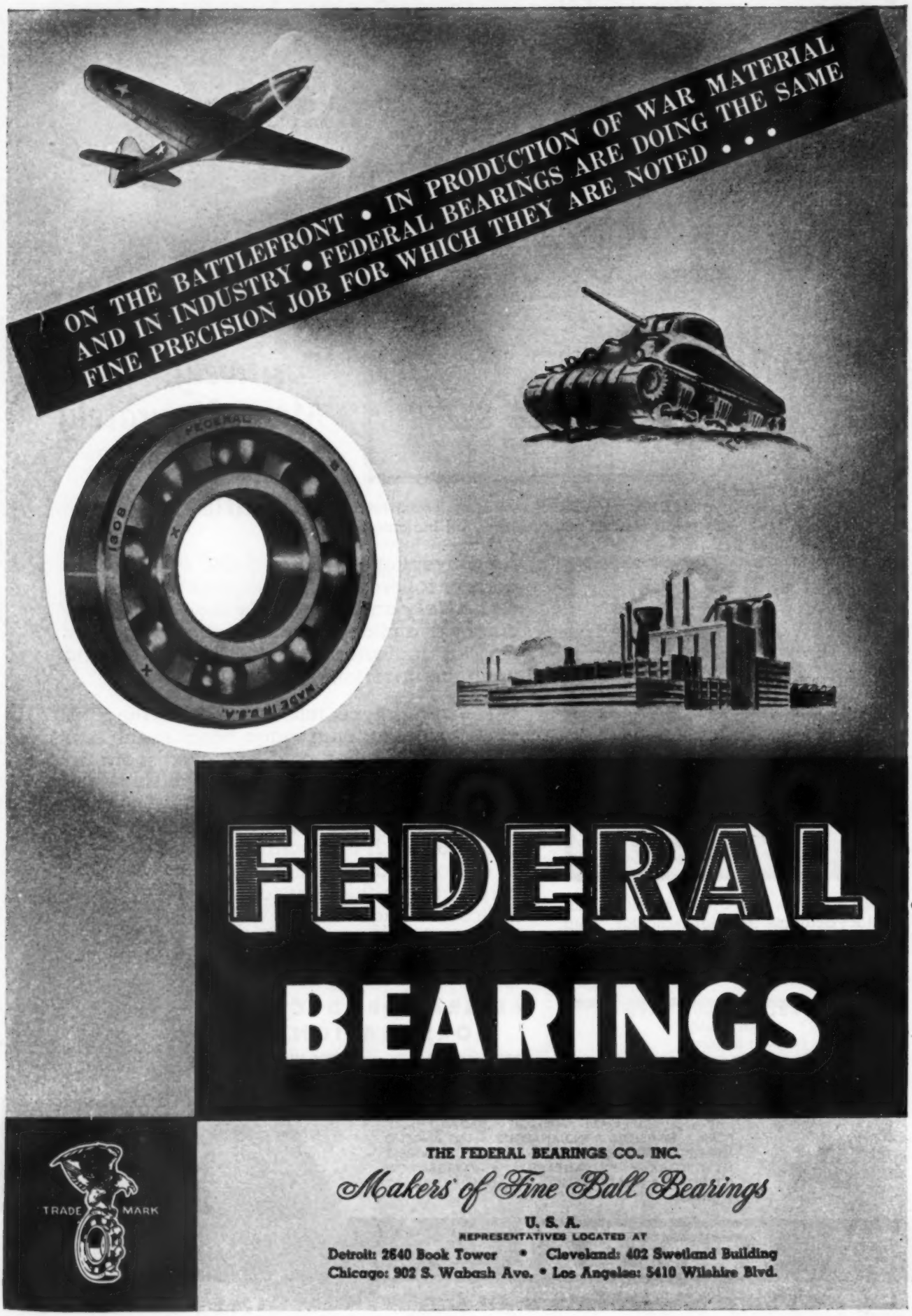
★ FEDERAL ★

PRECISION MEASURING INSTRUMENTS


ON THE BATTLEFRONT • IN PRODUCTION OF WAR MATERIAL
AND IN INDUSTRY • FEDERAL BEARINGS ARE DOING THE SAME
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THE FEDERAL BEARINGS CO., INC.
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Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building
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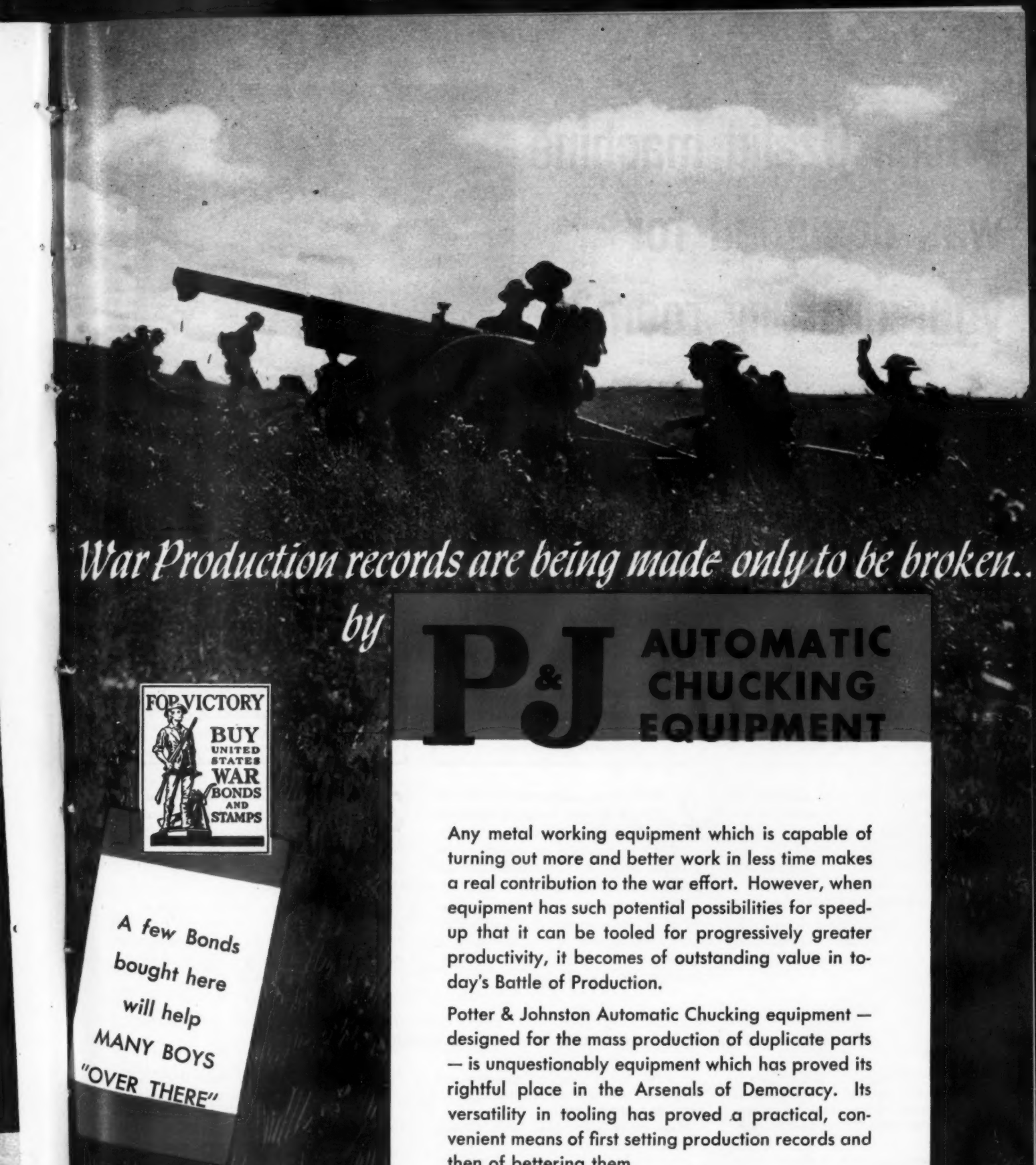


War Production records are being made only to be broken..

by

P&J AUTOMATIC CHUCKING EQUIPMENT

Any metal working equipment which is capable of turning out more and better work in less time makes a real contribution to the war effort. However, when equipment has such potential possibilities for speed-up that it can be tooled for progressively greater productivity, it becomes of outstanding value in to-day's Battle of Production.

Potter & Johnston Automatic Chucking equipment — designed for the mass production of duplicate parts — is unquestionably equipment which has proved its rightful place in the Arsenals of Democracy. Its versatility in tooling has proved a practical, convenient means of first setting production records and then of bettering them.

P & J engineers will help you take full advantage of P & J tooling possibilities to assure the maximum in performance.

The POTTER & JOHNSTON MACHINE CO.
Pawtucket, R. I.

Which Ozalid machine was designed for your drafting room?

A Model B . . . Like Grumman's
Grumman Aircraft Engineering Corp.
Bethpage, Long Island, New York

A Model F . . . Like Blaw-Knox's
Blaw-Knox Corporation
Pittsburgh, Pennsylvania

A Type 2600 . . . Like Standard Oil's
Standard Oil Company of New Jersey
Elizabeth, New Jersey

1. For large-scale print production. An Ozalid Model B will turn out whiteprints of your engineering drawings at speeds up to 20 feet per minute. Printing and Dry Developing are done in one continuous operation . . . and there are many exclusive features.

It can be relied upon for dependable and economical round-the-clock performance. *Price $2,850.00 F.O.B. Johnson City, New York.*

2. For medium production. The Model F is ideal when demands are moderate or occasional. It may also be used to supplement other equipment, or provide on-the-spot printmaking in departmentalized organizations.

The printer and developer are combined in one compact unit and whiteprints can be turned out at speeds up to 4 feet per minute. *Price $825.00 F.O.B. Johnson City, New York.*

3. For use with your present printer. If you have already installed expensive blueprinting equipment . . . you can add a Type 2600 Dry Developing unit and receive all the benefits of Ozalid Printmaking.

Expose Ozalid sensitized materials in your printer—then transfer to the Type 2600. Rate of development is approximately 5 feet per minute. *Price $370.00 F.O.B. Johnson City, New York.*

YOU CAN'T HAVE THIS VERSATILITY—WITHOUT AN OZALID MACHINE

Ozalid's Dry Development distinguishes it from all other printmaking processes. It eliminates baths, driers, plumbing connections—is responsible for compact machine design.

What's most important, it allows you to use a full line of sensitized materials and obtain exclusive printmaking "extras".

WITH OZALID YOU CAN:

Make prints having blue, black, maroon lines on white backgrounds.

Produce duplicate "originals"; reclaim soiled or worn tracings; eliminate drafting waste when making corrections.

Use cut sheets as well as roll stock—eliminate trimming waste.

Turn out all prints in the same manner. No variations in production.

WRITE FOR CATALOG AND SAMPLES OF OZALID WHITEPRINTS.

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

JOHNSON CITY, N. Y. ★ OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

GOD OF WAR

Among the many Clearing Presses built for the production of war material is this 1500 ton knuckle lever press . . . used for heading 75 mm *steel* cartridge cases.

In addition to being a practical solution to the numerous problems encountered in designing a press for working cartridge cases of steel, this Clearing mechanical press also provides the means for high speed production. Heading operations may be performed at rates up to sixteen strokes per minute. A hydraulically controlled oscillating feed centers the work accurately below the ram. A liftout device removes finished work from the die.

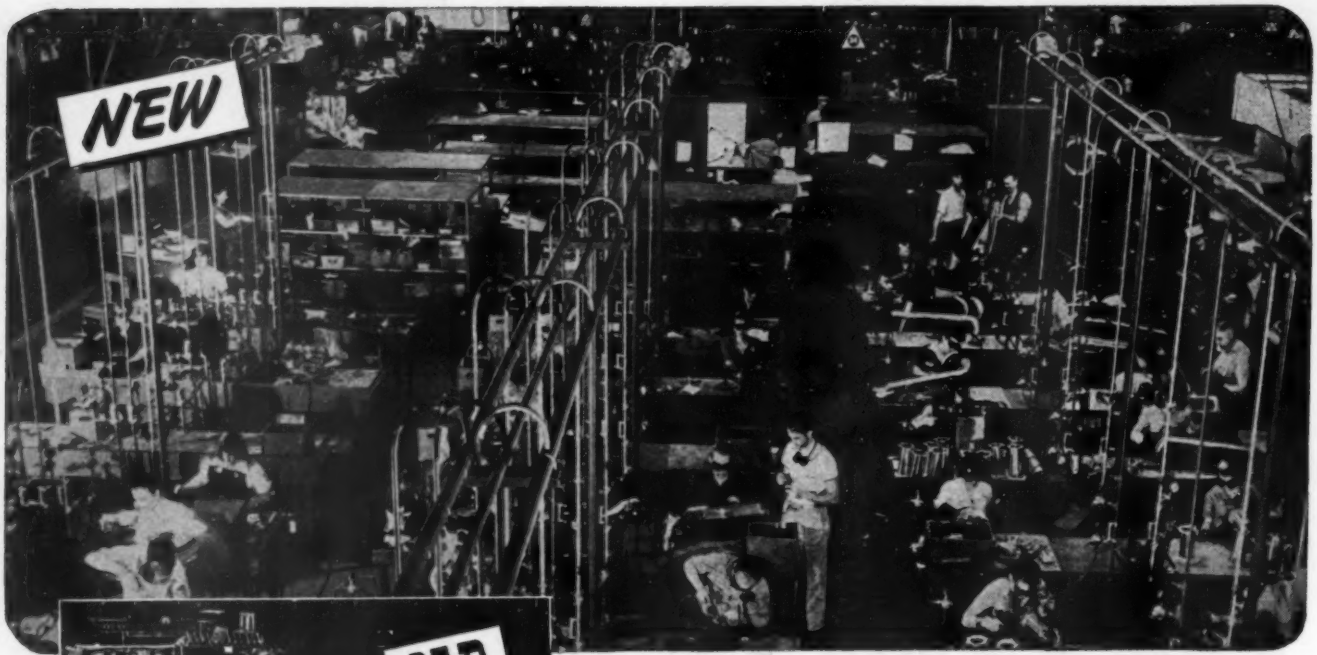
Now or in the future, when faced with metal working problems that presses might solve, you are invited to call on Clearing engineers. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.

CLEARING

CLEARING PRESSES

MECHANICAL AND HYDRAULIC

More working space—
More productive welding time



. . . with an Airco pipeline gas distributing system

Here's graphic evidence of how an Airco pipeline gas distributing system increases the productivity of the modern welding shop.

At top is the welding department of Bell Aircraft Corporation, Buffalo, N. Y., showing the new piping system that supplies hydrogen, oxygen, and acetylene gas direct to each welder's table. At left is the same shop before the pipeline was installed.

The removal of cylinders from the work area to a central supply station, made available an additional 600 sq. ft. of working floor space. Moreover, the new system relieved welders of the job of changing cylinders, connecting and disconnecting regulators, setting-up and similar time-consuming tasks. As a result, each welder gained an average of ½ hour additional productive time per day.

The advantages offered by this modern method—in terms of reduced cylinder handling, increased welding productivity, more economical operation—are equally desirable for large and medium sized plants.

Air Reduction's Applied Engineering Department will be glad to survey your plant and submit detailed plans—including estimated costs—for complete gas distributing systems and cylinder manifolding arrangements. This service is available without charge through your nearest Air Reduction office.

Send for free booklet: "Planning Your Oxyacetylene Installation" describes operation of manifolds and acetylene generators; describes pipeline operating and safety devices. Typical plant piping layouts are described. Get free copies through your Air Reduction office.

BUY UNITED STATES WAR BONDS

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MODERN Cleveland PRESSES

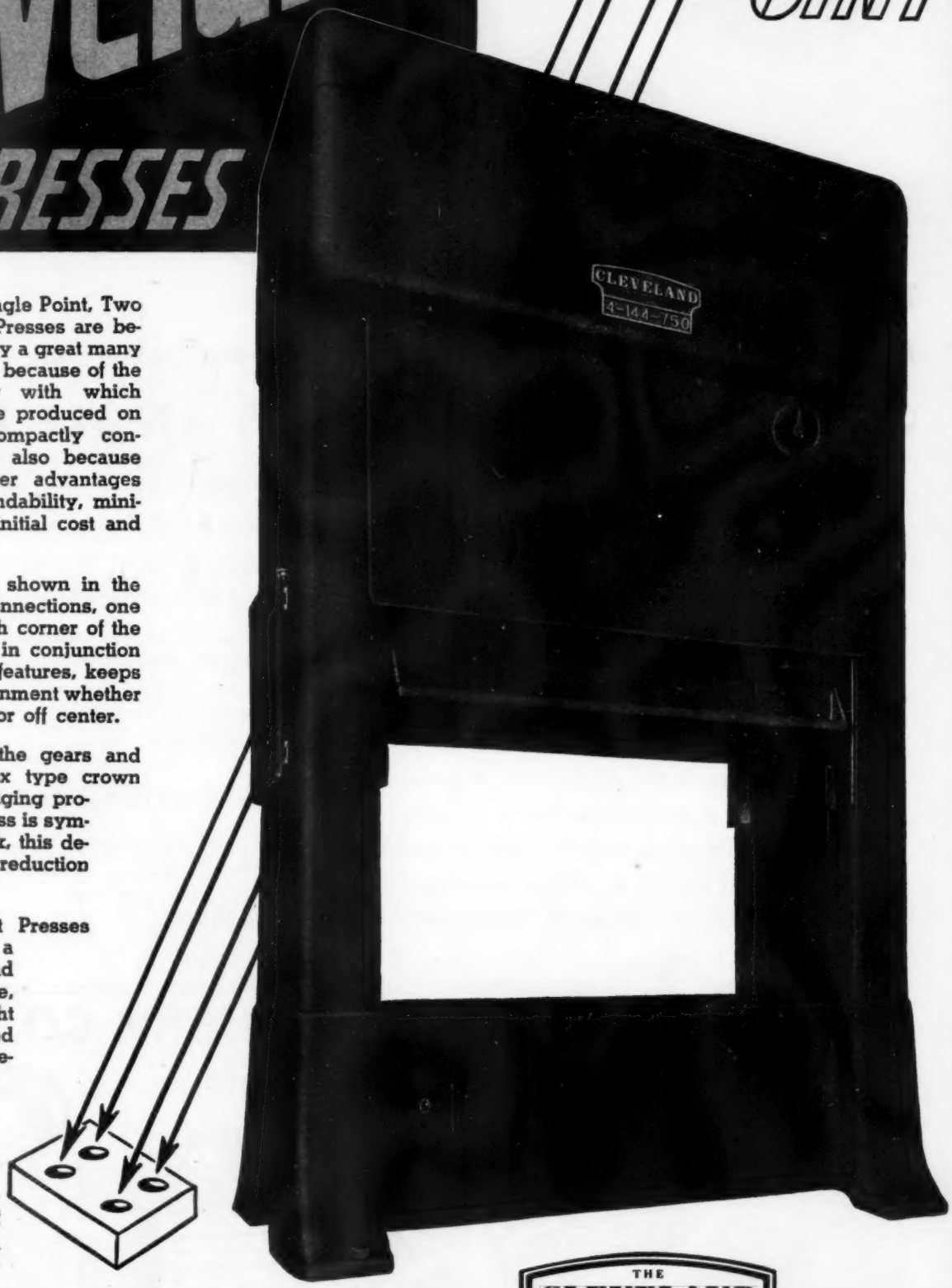
4 POINT

Modern Cleveland Single Point, Two Point and Four Point Presses are being extensively used by a great many leading manufacturers because of the speed and accuracy with which duplicate parts can be produced on these rigidly and compactly constructed Presses, and also because they offer many other advantages such as greater dependability, minimum upkeep, lower initial cost and ease of operation.

The Four Point Press shown in the illustration has four connections, one at (approximately) each corner of the slide and this design in conjunction with other Cleveland features, keeps the slide in perfect alignment whether the load is on center or off center.

The arrangement of the gears and drive unit in the box type crown eliminates all overhanging projections and as the Press is symmetrical front and back, this design contributes to a reduction of overall floor space.

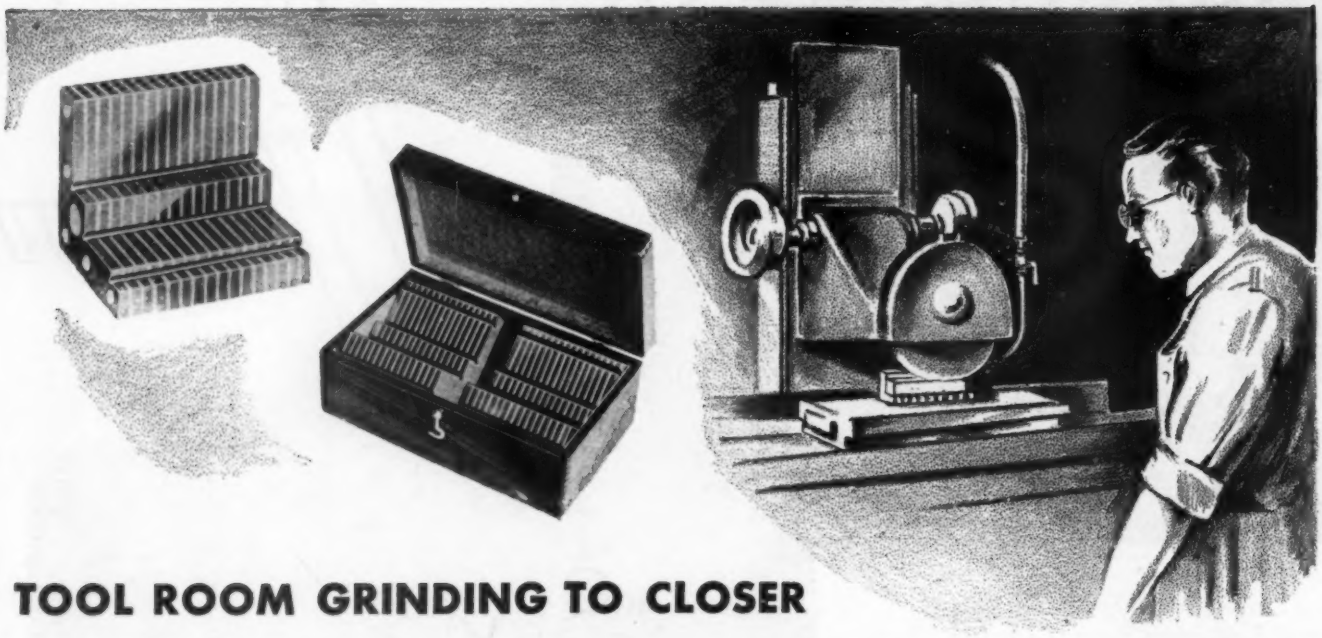
Cleveland Four Point Presses can be furnished in a wide range of sizes and capacities and the stroke, adjustment, shut height and bed area modified to suit particuar requirements.



This Cleveland 4-144-750 Four Point Press has a bed area of 80" x 144", stroke 30", adjustment 6" and a capacity of 750 tons.

THE CLEVELAND PUNCH & SHEAR WK'S CO. U. S. A.

THE CLEVELAND PUNCH & SHEAR WORKS CO CLEVELAND·OHIO



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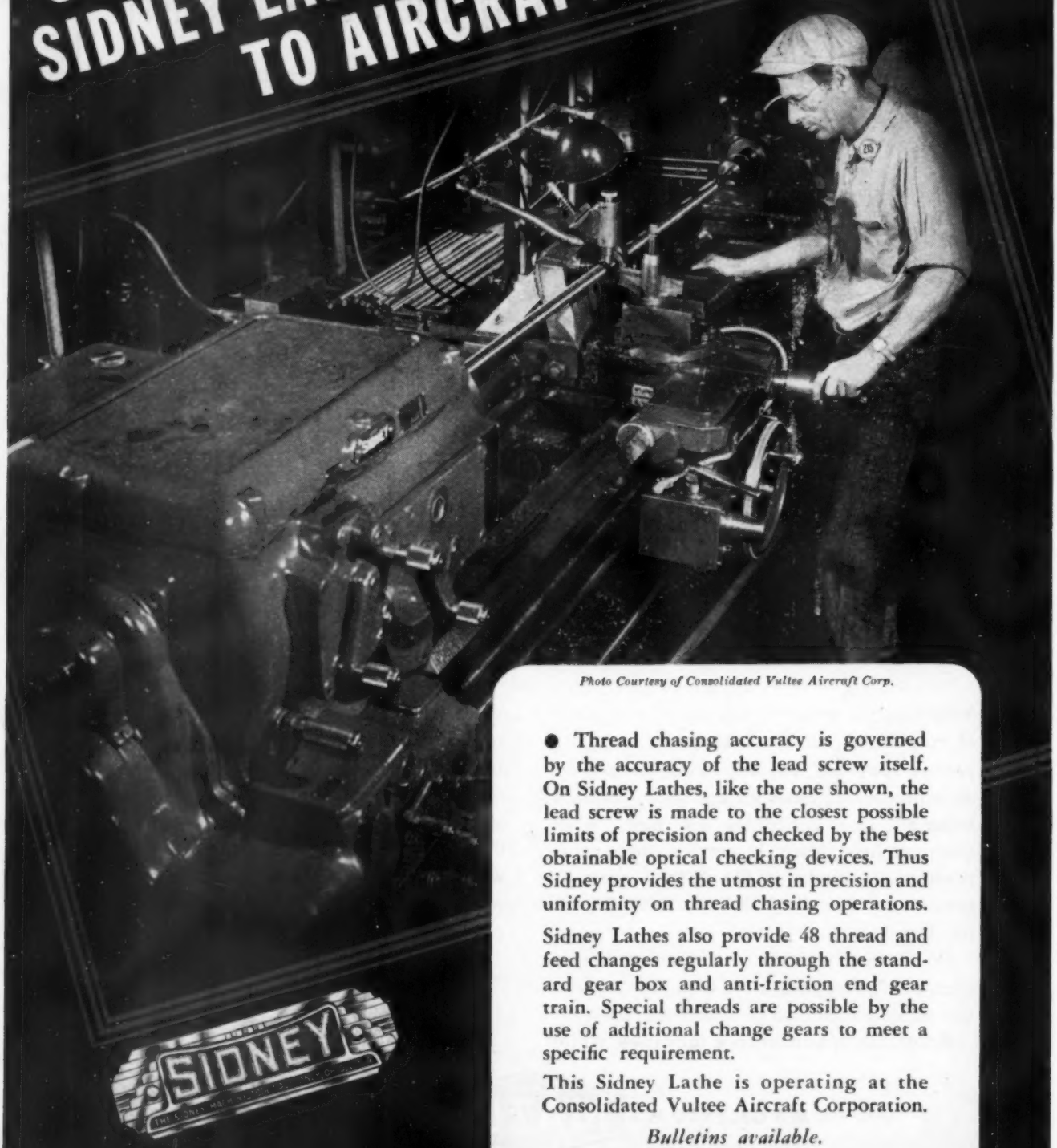

Photo Courtesy of Consolidated Vultee Aircraft Corp.

● Thread chasing accuracy is governed by the accuracy of the lead screw itself. On Sidney Lathes, like the one shown, the lead screw is made to the closest possible limits of precision and checked by the best obtainable optical checking devices. Thus Sidney provides the utmost in precision and uniformity on thread chasing operations.

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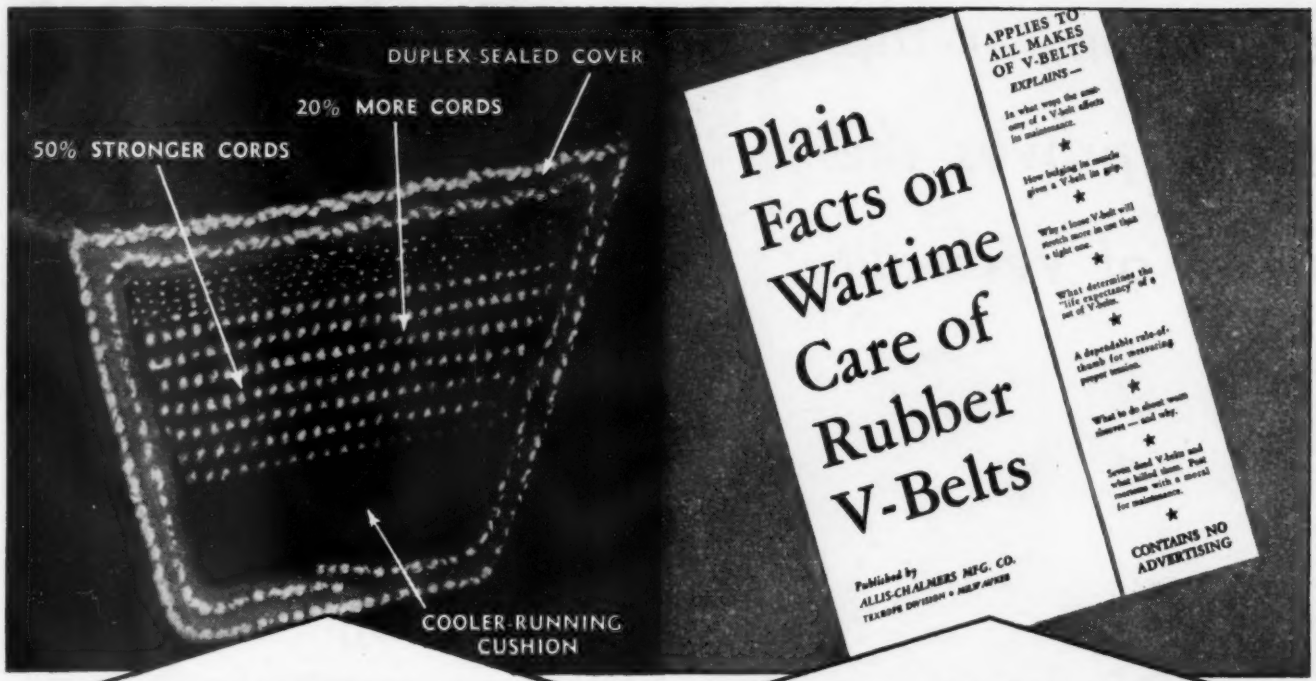

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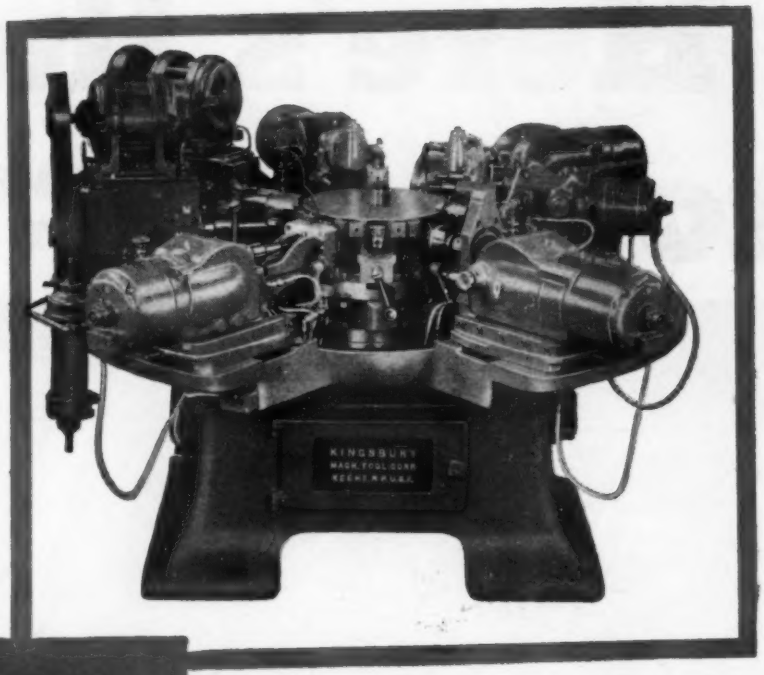

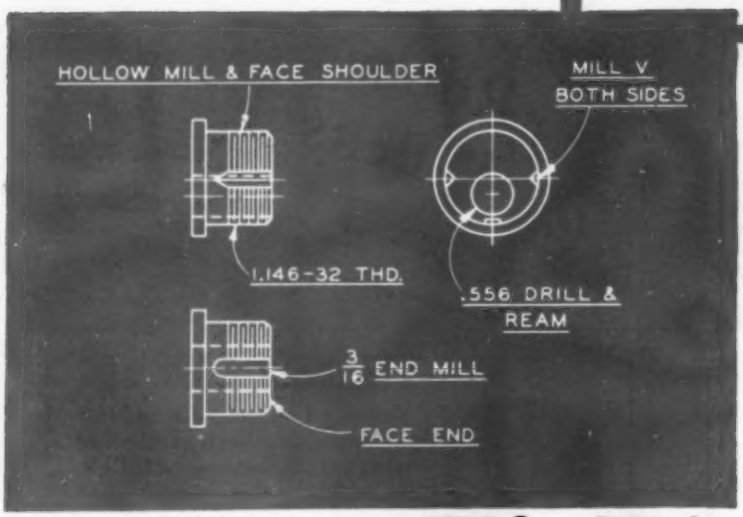

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by KINGSBURY

KINGSBURY versatility is well exemplified in the widely different machining operations performed on bronze lock cylinders. For example, note that hollow milling, facing, V-milling, drilling, reaming, end milling and end facing are included in this set-up on a Model GD FLEXIMATIC. By being able to handle all these operations with a *single chucking of the work*, production is stepped up tremendously.

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HERE'S a Super-Service Radial at the plant of American Machine and Metals, Inc., in Illinois, being used to bore, drill and tap holes up to 4.173" diameter on a gun mount pedestal casing approximately 4' high by 3' across base. Tapping involves 22 holes of various sizes. Limit of accuracy is .001. While production figures are not available for publication, we can say with assurance that the floor-to-floor time is exceedingly low. Summed up in the words of the operator "This machine handles easily —does a good job." Such commendation typifies the kind of report we receive from operators everywhere who speak from actual experience with Super-Service Radials.

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PERHAPS you have a 1909 quarter in your pocket right now. Look at it. In one claw the American eagle holds a bundle of arrows, in the other, an olive branch—ready for war—ready for peace!

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We must not make another mistake and be unprepared for peace. What we do after this war to help a stricken world will be as important as our leadership and industry during this war.

If private industry anticipates the vast postwar demands which will fall upon American industry, and plans for it now, there will be work and jobs for millions of returned soldiers and ex-war workers.

In a great reconversion program, American industry will need manpower—womanpower—and skilled management. It will need new machines, new tools, and new methods.

A recent survey indicated that major industry groups plan to spend over 2¼ billion dollars for reconversion and modernization. Of this sum 47.7% is allocated for new equipment, 26.4% to replace old equipment, 25.9% to repair old equipment. A manufacturer who handicaps his workers on production lines with outmoded, inefficient equipment and machines will be left far behind in fast-moving postwar competition.

WARNER & SWASEY
Turret Lathes
Cleveland

IT IS PATRIOTIC TO PLAN NOW FOR THE POSTWAR ERA

Warner & Swasey offers you practical help on postwar planning. We have a corps of engineers who are skilled in *all* machine operations involved in production of precision parts made of metal. They are helping many war plants improve methods and machines for greater production. They will continue to do so, but their services are also available to management interested in planning *now* for the future. Write Warner & Swasey, Cleveland 3, Ohio.

YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

What's in This Issue

He Learned About Women

The employment of women and the handling of factors influencing it is the subject of a survey recently completed by the National Metal Trades Association. Edward J. Kunze, industrial engineer with N.M.T.A. has authored an analysis of the reported findings of this survey, and his article on page 83 tells what has influenced women's hiring, uniforms, pay, transportation, discipline, training and a multitude of other considerations related to this wartime aspect of industry. You will be interested if you employ women in your plant.

Resistance Against Leaks

Seam-welding methods, problems and procedures are treated of in the fourth of a series of articles on the use of resistance welding, by R. I. Gillette and J. F. Young, General Electric Company. This installment, beginning on page 88, tells how overlapping spots are placed to form a continuous seam, especially useful in the fabricating of gas-tight or leak-proof joints.

JOHN M. WALTER

Tools for Speed

Increased speeds and faster table reversal of modern planers calls for use of proper cutting tools, automatic tool lifters and correct back rake angles. "Tools for High-Speed Planing," by John M. Walter, chief engineer, G. A. Gray Company, is devoted to the selection of tool steel and the grinding of tools suited to such an operation. Page 90.

WALTER K. BAILEY

From Tools to Components

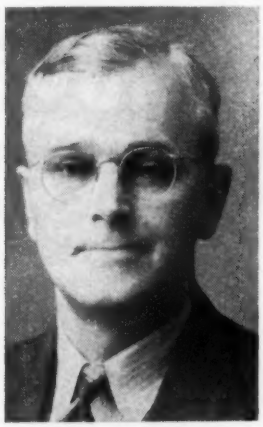
With the tapering off of machine tool demand, producers are turning to the manufacture of war products. Typical of these conversions was that made by Warner and Swasey from turret lathes to heavy diesel engine crankcases, aircraft engine clutches and power drives for anti-aircraft guns. How these items were selected from a group of subcontracts offered, so as best to fit the skills and machines available, is told by Walter K. Bailey, vice president, Warner and Swasey Company. You'll find it on page 94.

Solves Shift to Steel

The shift by Dura Division, Detroit Harvester Company, from the manufacture of brass shell cases to that of 20-mm. steel cases, entailed the solution of certain problems. Yet the conversion—from second largest producer of brass cases, to leading producer of steel cases—was made in less than four months. The problems encountered, and how they were met, are discussed by Major R. G. Van Ness, Office of the Chief of Ordnance, page 105. Two-color sketches clearly illustrate every step in the process.

The Science of Slings

The use of slings in the handling of a variety of shapes and sizes, from raw materials to finished products, requires careful application of certain precepts. The slings must be made of material strong enough for the load, capable of easy application and certain not to damage the finish. C. R. Hochmuth, assistant works manager, Kearney & Trecker Corporation, tells of the experience of that company in the handling of a variety of loads. Page 93.



L. W. MACOMBER

Gage Czar

To assure plant-wide standards of accuracy, General Electric Company has made one man responsible for gage control throughout its River Works. His authority is absolute and extensive, including determination of need, purchase, and control of repairs, storage, issuance and inspection. L. W. Macomber, General Electric, describes this system, in an article you'll find on page 97.

COMING

The efficiency of induction heat-treating apparatus will be largely determined by the design of the coil in which the work is inclosed. The selection of the coil for various types of work is the subject of a soon-to-be-published article.

Pit-type furnaces have been installed in many war plants because of their economical and efficient operation for heat-treating a wide variety of parts on a batch basis. Properly designed work fixtures will increase furnace loads by as much as 50 percent for carburizing and nitriding cycles. They also avoid soft spots and distortion by proper work support and atmosphere distribution. Basic principles of construction for a variety of fixtures will be detailed in an early issue.

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Forming one sheet and crimping another on each stroke . . . double "out put."

Smooth, powerful Cincinnati Press Brakes performing like machine tools . . . do a clean job with these Double Decker Dies.

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American Machinist

ESTABLISHED 1877 • BURNHAM FINNEY, EDITOR

A Report on Women in Industry

BY EDWARD J. KUNZE, INDUSTRIAL ENGINEER, NATIONAL METAL TRADES ASSOCIATION

RECENTLY the National Metal Trades Association conducted a survey on women in industry during which 62 plants in the New England, Middle Atlantic and North Central districts were visited. Of the plants visited, the employment of women is a normal procedure of 32, while in the other 30 their employment began during the war period. Total employment of the plants was 221,439, of which 65,527, or 31 percent, were women. Range of total employment in individual plants was 84 to 42,000 and that of women employed from eleven to 12,624.

Points covered in the survey ranged from the number of years women have been employed in various plants to regulations on smoking. Answers show how factors incidental to the hiring of women have been handled and what has influenced their hiring, uniforms, supervision counseling, educational requirements, part-time work, pay, rest periods, recreational facilities, transportation, discipline, training and safety. Here are the findings on principal points:

Women take pride in wearing some type of uniform work clothing. In addition to improving and standardizing the appearance of women workers, uniforms are said to improve morale, eliminate dress competition and reduce accidents

Recruitment. The United States Employment Service and personal application serve as the principle sources of women recruits, but solicitation on the part of employees is also furnishing much female help. The latter method has many advantages because the company is favorably advertised and the new employee has a friend to help her become acquainted. More than half of the plants surveyed use women employment interviewers to talk to prospective female employees.

In the majority of plants visited, there is no discrimination against employment of married women if domestic conditions do not interfere. Some large companies reported that from one-half to two-thirds of their women employees are married, many having one or more children. Objections to employment of women in the young married groups, sometimes said to be a disturbing influence, can be overcome by proper selection and placement and through the use of trained counselors.

Preference is usually given to married women whose husbands are in the armed services, if they are qualified. Many managements feel that this will relieve, somewhat, adjustment at the war's end when the reemployment of servicemen will be a dominant issue.

Tests. Tests for applicants are used by 18 of the 62 plants and most of these are aptitude tests. Tests are valuable as guides but do not take the place of intelligent interviews by experts. They greatly reduce the time required to arrive at a reliable evaluation. Chief objections to standard tests are that they are not always tailored to the job, that considerable caution must be exercised in their application and that an expert is usually required to interpret the results.

Educational and Age Requirements. Because of the difficulty in securing help, most employers of women are dropping all set educational and experience requirements for shop work. Thirty-six plants require only that the woman can read and write; eleven require eighth grade edu-

Prepared under the sponsorship of the N.M.T.A. Activities Committee, made up of leading industrial executives representing key manufacturing centers.

cation; eight require two years of high school and seven demand high school graduation. No factory or machine experience is required by 58 plants, although such experience is regarded as desirable. Two of the reporting factories require vocational school graduation.

Equal Pay for Equal Work. In 30 of the surveyed plants no difference was reported in initial wage rates for inexperienced men and women and in 34 the rates are the same after a probationary period is served. Differences in wages for the same work are due, in most cases, to the fact that jobs involved may require some assistance from men. In very few cases are men paid higher rates than women for identical work and in every instance women have equal opportunity for upgrading.

In case where wage differentials do exist because of variations in job requirements, the initial pay differential ranges from three cents to 32½ cents, with an average of ten cents. After a probationary period the range is from three to 27½ cents an hour less for women, with an eleven cent average differential. After the average probationary period of 51 days, women's pay increases are from three to 15 cents.

Working Shifts. Many factors govern the shift on which women work, with, in most cases, standard shifts starting at 7 a.m., 3 p.m. and 11 p.m. Women workers usually prefer to remain on one shift because of the difficulty in adjusting themselves to rest changes. Young women prefer the first shift and married women usually want to work on the same shift as their husbands. Women having small children, and someone to care for the youngsters, often prefer to work the third shift so they can supervise their children's departure for school and their lunches. Where shifts are rotated, women having children usually are permitted to choose their shifts, but remain on this shift without changing unless such a change is urgent.

Uniforms. It has been found that women take pride in wearing some type of uniform and prefer to have them in a color similar to that worn by male employees. Uniform clothing improves morale, eliminates dress competition and reduces accidents. Experience shows that women employee representatives should be consulted before style and color of uniforms are chosen.

Although the wearing of uniforms is acceptable to most women, they do not take readily to requirements forcing them to wear caps. Many women feel that caps do not permit them to present an attractive appearance and insist upon leaving some hair exposed. Attempts are being made to design a suitable hair net, but these do not keep out dust. One solution has been the use of a net to cover all hair and over this is worn a small cap to keep out dust. Suggested as the best answer is the use of closely tied bandanas. These permit some individual choice and allow color to be added to the uniform.

Laundry is usually cared for by the company where absolute cleanliness is necessary for product protection but in most plants workers pay for laundering their own uniforms. However, a few companies pay for this work to be certain uniforms are always clean and in good repair.

Women Counselors. In three-quarters of the plants surveyed women counselors are employed to handle personal problems of women workers. These counselors are usually mature, married women who are trained, either before or after employment, in first aid and psychology for human relations. They are charged with the physical and moral well-being of the women and are responsible for insuring adequate cafeteria, rest room and other facilities. It is her duty to keep in touch with recruits, especially during the first month of employment. In smaller plants the nurse, women union stewards and others assume some of these duties if a full-time counselor and their identities are thoroughly pointed out to the women employees. In larger plants, there may be one or more matrons in rest rooms who act as intermediaries under a women's counselor. A few large plants assign a number of workers such as 300 or 500 to one counselor.

Factory Occupations in War Industries on Which Women are Now Being Employed as Reported in the Three Areas Surveyed

H—Heavy work M—Medium work L—Light work
x—Women are used on the occupation involved

OCCUPATION	NEW ENGLAND			NORTH ATLANTIC			NORTH CENTRAL		
	H	M	L	H	M	L	H	M	L
Assembler—Rough	—	x	x	—	x	x	—	x	x
Assembler—Precision	—	x	x	—	x	x	—	x	x
Assembler—Complete Machines	—	—	—	x	x	x	—	x	x
Bench Worker	—	—	x	—	x	x	—	x	x
Bindery Worker	—	—	—	—	—	x	—	—	x
Boring Machine—Horizontal—Op. Only	—	—	—	—	—	—	x	—	—
Boring Machine Operator—Vertical—Operate Only	—	—	—	—	—	—	x	—	x
Borematic Operator	—	x	—	—	—	—	—	—	—
Braiding Machine—Set up and Operate	—	—	—	—	—	—	—	—	x
Broaching Machine	—	—	—	—	—	—	—	—	x
Burner—Flame Cutting	—	—	—	—	x	x	—	—	—
Chemist	—	—	—	—	—	—	—	—	x
Chucker	x	—	x	—	—	—	—	—	—
Coremaker	—	—	—	—	—	x	—	—	x
Crane Operator	—	—	—	—	—	—	x	x	x
Cutting-Off Operator	—	x	—	—	x	—	—	—	—
Draftsman	—	—	x	—	—	x	—	—	x
Drill Press Set Up and Operate	—	x	x	—	—	—	x	x	x
Drill Press—Operate Only	—	—	x	—	x	x	—	x	x
Drill—Sensitive—Set Up and Operate	—	x	—	—	—	—	—	—	x
Drill—Sensitive—Operate Only	—	—	—	—	—	—	—	—	x
Electroplater	—	—	—	—	—	—	—	—	x
Electroplater Helper	—	—	—	—	x	x	—	—	x
Elevator Operator	—	—	x	—	—	—	—	—	—
Etcher	—	—	x	—	—	—	—	—	—
Expediter	—	—	x	—	—	—	—	—	x
Facing Machine Operator	—	—	—	—	—	x	—	—	—
Filer and Burrer	—	—	x	—	x	x	—	—	x
Foundry Instrument Attendant	—	—	—	—	—	—	—	—	x
Gear Cutter and Hobber—Set up and Operate	—	—	—	—	—	—	—	x	x
Gear Cutter and Hobber—Op. Only	x	x	x	—	—	—	—	—	x
Greaser and Wrapper	—	x	x	—	—	—	—	—	—
Grinder—Cutting Tool	—	—	—	—	—	x	—	x	x
Grinder—Centerless	—	—	x	—	x	—	—	—	—
Grinder—Drill	—	—	—	—	x	x	—	—	x
Grinder—External, Set Up and Operate	—	x	—	—	—	—	—	—	x
Grinder—External—Op. Only	—	x	x	—	—	—	—	—	—
Grinder—Internal—Set Up and Operate	—	—	x	—	—	—	—	—	x
Grinder—Internal—Op. Only	—	x	—	—	—	—	—	—	x
Grinder—Milling Cutter	—	—	x	—	x	x	—	x	x
Grinder—Rough—Operate Only	—	—	x	—	x	x	—	x	x
Grinder—Surface—Set up and Operate	—	—	—	—	—	—	—	—	x
Grinder—Surface—Operate Only	—	x	x	—	x	—	—	—	x
Grinder—Universal Tool	—	—	x	—	x	—	—	x	x
Guard	—	—	x	—	—	—	—	—	x

Women's counselors have proven helpful in handling the emotional adjustment of workers. If not handled properly, this sometimes becomes a major problem. Likewise, the counselors control the moral issue which may arise through improper conduct of male employees. Any upsurge in immorality can be controlled and reduced by proper instruction of foremen, and through them the male workers, before women are employed and thereafter through competent counselors. Proper treatment usually clears up disciplinary problems arising from the presence of women workers in the plant.

Supervision. Most women workers prefer working under men supervisors. This is primarily due to the more critical attitude of women supervisors over detail matters which might seem inconsequential to a man. Too, women are likely to be jealous and suspicious of favortism in supervisors of their own sex.

In 49 of the plants, all supervision of women workers is handled by men, while twelve of the plants use both male and female supervisors. In many cases the choice of supervision depends upon the length of time women have been employed in that particular factory and upon the type of work done. Where both sexes are used in supervisory capacities, the number of female supervisors is usually small and for minor roles. In such work as bench inspection women supervisors are used successfully. Positions requiring technical knowledge and experience with machinery are preferably filled by men supervisors.

Training. Vestibule training, usually preemployment is type and orientational in effect, should be continued to include post-employment training to give the principles underlying the job to be undertaken. Vestibule training may well be carried over to include supervisors. Forty-one plants of the group studied have vestibule training and five additional plants use it only for special work such as welding or inspection. Instructors should be experts when the subject needs specialized knowledge. Recruits in general should be required to take some such course as it gives opportunity to prune out wrong working habits. Proper instruction reduces waste, avoids accidents, eliminates embarrassment to the newcomer and saves money for management.

All of the plants give on-the-job training, usually by foremen or leading workers. Many of the plants cooperate with schools outside of the plant such as war training schools, public and vocational schools and colleges. Shop training is best given in a separate room or separate part of the shop to help overcome self-consciousness on the part of the new worker. Instructors should be trained in teaching methods as otherwise they are apt to resort to telling instead of teaching. It is important that the recruit learn to do the job correctly the first time, as unlearning is often a harder procedure than learning.

Part-time Workers. Part-time workers are used in 15 of the plants and some of the others are contemplating hiring women on this basis. Numbers employed range from one to 150. Some of the plants using part-time female labor use these women for char work. Most plants, unless they have been users of students of cooperative-plan engineering schools, have had no experience with part-time workers and for this reason refrain from using part-time labor.

Among the jobs most easily adjusted to part-time schedules are light inspection and assembly work, drill press, milling machine, tapping machine and lathe operation and bench work. In no case should part-time workers be forced upon a department manager or foreman and in any event the emergency nature of the hiring of such workers should be explained to secure the cooperation of full-time workers.

Among the most fruitful sources of part-time workers are housewives and high school students who may work on four hour shifts. Some companies seek high school and college girls for part-time work in the hope that they will have the first chance to hire them in full-time work during vacations and after graduation. Several women's colleges have started cooperative plans for

OCCUPATION	NEW ENGLAND H	NEW ENGLAND M	NEW ENGLAND L	NORTH ATLANTIC H	NORTH ATLANTIC M	NORTH ATLANTIC L	NORTH CENTRAL H	NORTH CENTRAL M	NORTH CENTRAL L
Heat Treater	—	—	x	—	—	—	—	—	—
Heat Treatment Attendant	—	—	x	—	—	—	—	x	—
Helper—General	—	x	—	—	x	—	—	x	—
Inspector—Complete Machines or Units	—	x	x	—	x	x	—	x	x
Inspector—Parts	—	x	x	—	x	x	—	x	x
Insulator	—	—	—	—	—	—	—	x	x
Janitress	—	—	x	—	x	x	—	x	x
Lathe—Bench—Set Up and Operate	—	—	x	—	—	—	—	—	x
Lathe—Bench—Operate Only	—	—	x	—	—	x	—	x	x
Lathe—Engine—Set Up and Operate	—	x	x	—	—	x	—	x	x
Lathe—Engine—Operate Only	—	x	x	—	x	—	—	x	—
Lathe—Speed—Set Up and Operate	—	—	—	—	—	—	—	x	x
Lathe—Speed—Operate Only	—	—	—	—	—	—	—	x	x
Lathe—Turret—Set up and Operate	—	—	—	—	x	—	—	—	—
Lathe—Turret—Operate Only	—	x	x	—	x	x	—	x	x
Lapping Machine Operator	—	x	—	—	—	—	—	—	—
Layout Worker	—	—	—	—	x	x	—	—	—
Mill—Hollow Operator	—	—	—	—	—	—	—	x	—
Milling Machine—Set Up and Operate	—	x	x	—	x	x	—	x	x
Milling Machine—Operate Only	—	—	x	—	x	x	—	x	x
Milling Machine—Bench—Set up and Operate	—	—	x	—	—	—	—	—	x
Milling Machine—Operate Only	—	—	x	—	—	x	—	x	x
Packer	—	—	x	—	—	x	—	x	x
Painter and Sprayer	—	—	—	—	x	x	—	x	x
Paint Department Helper	—	—	—	—	—	x	—	—	—
Paper Folding Machine Operator	—	—	—	—	—	—	—	x	—
Planer—Operate Only	—	—	—	—	x	—	—	x	—
Polisher and Buffer	—	x	—	—	—	x	—	x	x
Press Operator—Bench	—	—	—	—	—	—	—	—	x
Press Operator—Kick	—	—	—	—	—	—	—	x	x
Punch Press—Operate Only	—	—	x	—	x	x	x	x	x
Radial Drill—Set up and Operate	—	—	—	—	x	—	—	—	—
Radial Drill Operate Only	—	—	—	—	—	—	x	x	—
Riveter	—	—	—	—	—	x	—	x	x
Screw Machine—Automatic—Set up and Operate	—	—	x	—	—	—	—	x	x
Screw Machine—Hand—Operate Only	—	x	x	—	—	—	—	x	x
Shaper Operator	—	—	—	—	x	x	—	—	—
Shear Operator	—	—	—	—	—	—	—	x	—
Solderer	—	—	—	—	—	x	—	—	x
Sorter	—	—	—	—	—	—	—	—	x
Splining Machine Operator	—	x	—	—	—	—	—	—	—
Temperer—Torch and Lead	—	—	x	—	—	—	—	—	—
Templet Maker	—	—	—	—	—	x	—	—	—
Tester	—	—	x	—	x	x	—	—	—
Threading Machine Operator	—	—	—	—	—	x	—	x	—
Toolroom and Stockroom Attendant	—	—	—	—	—	x	—	—	x
Truck Driver (Motor Truck)	—	—	—	—	—	—	—	—	x
Truck Operator (Within Plant)	—	—	x	—	—	—	—	—	x
Winder—Close Requirement	—	—	—	—	—	—	x	x	—
Winder—Hand and Semi-Auto. Armature	—	—	—	—	—	—	—	x	—
Winder—Simple Winding	—	—	—	—	—	—	—	x	x
Welder—Arc and Gas	—	x	x	—	x	x	x	x	x
Welder—Spot	x	—	—	—	—	x	—	x	x
Wire Forming Machine Operator	—	—	x	—	—	—	—	—	x
Wirer and Taper	—	—	—	—	—	—	—	—	x

such work with local war industries. If the work schedules are properly staggered idle machine time can be prevented.

Rest and Recreation Facilities. Fifty-one of these plants provide cots, lounges, daybeds or davenports for the convenience of women employees and in 31 of these women employees serving as matrons are in constant attendance. Dressing rooms are provided with individual lockers in most of the plants and a number of them furnish a long vertical mirror to help the women keep up their personal appearances.

Rest periods are provided for by more than half of the plants and these periods range from 10 to thirty minutes. Some employers who formerly provided for them have abolished such periods, claiming that the privilege was abused. Some prevent such abuse by posting matrons in the rest rooms from time to time to check on time spent there. Employees are warned that such checks are to be made and told why they are made. Most of the rest periods are held in the middle of each work period and smoking is usually allowed. Smoking is also permitted in the lunch rooms but is usually forbidden in toilet rooms as here again the privilege is often abused. Thirty percent of the plants allow smoking while working.

Recreational facilities range from none to elaborate field houses, and most companies have employee clubs of some type sponsored and supported to some degree by the company and administered by employees. Recreation rooms are most frequently used directly after the lunch period. It has been found that such clubs create a closer companionship between employees and a better attitude toward the company.

Absenteeism. Few plants have adequate records of tardiness, absenteeism and turnover for comparison between men and women, but absenteeism, especially among married women, may be expected to be higher. Family responsibilities cause more absence than illness because they still continue to absorb a large portion of a woman's attention. The emotional nature of women and their greater susceptibility to sickness lead to frequent absences from work, but careful selection, rigid physical examination and proper placement can reduce the absentee rate of women.

Turnover is reduced when actual records are kept and where there is an adequately trained exit interviewer through whom proper adjustments can be made. Forty-nine of the plants have exit interviewers.

Training should continue after the new employee has started work. At Westinghouse new women workers spend four hours a week in the classroom and the rest of their time on production lines

General. With one exception, unions have no objection to the employment of women. One company finds a difficulty in the insistence of its union that its members (men) may bid on the basis of seniority against women for any vacant job. This now keeps many women from occupation.

Although the conditions under which women work in factories are better as a rule than those under which men work, women are now filling many jobs which are far from clean. Usually women improve the conditions under which they work by their own inherent cleanly habits.

Plants located in outlying districts do not have, in most instances, as good protection for their women workers as those plants which can call upon city police as well as the plant guards during changes in shifts. In several cases, women night workers are escorted to transportation but protection at the home end of the trip is almost impossible during the night periods.

Women excel in operation of all types of light machines and in small assembly and inspection work, including both visual and precision. Women are now successfully employed on light riveting and welding, time study, crane and truck operation, electric wiring, painting and spraying, instrument reading and many other occupations as shown in the accompanying chart. Their thoroughness, manipulative ability and delicacy of touch fit them admirably for accurate work.

Except for jobs requiring heavy manual lifting and great physical strength, extremely hazardous occupations, those involving considerable stretching and reaching and those where the worker is exposed to considerable heat, women may be employed successfully in almost any situation, if the job has been tailored to suit her requirements. Through the use of electric hoists and other mechanical devices many plants are using women on heavy work. In one plant a woman is operating a 25-ton crane. Where jobs need the assistance of men in set-up or manipulation, the job is usually rerated to make the pay conform to the work which is actually done. In some plants women are hired only on those jobs where they can do all of the work without assistance.

The complete report, which has been distributed to the membership of the association, consists of a tabular chart of answers received on 26 specific subjects; a tabulation of occupations in which women are employed, divided into sectional lists, an intrepretation of the answers and an extensive bibliography of published material.

Disks for gate and globe valves are rotated slowly by a small motor-driven positioner as the operator welds on a hard facing of No. 6 Stellite. Disks requiring periphery welds are held in three-jaw chucks; for face welds, they are mounted on a flat table

Small Positioner Rotates Valve Disks for Hard Facing

TO FACILITATE the hard facing of valve disks, engineers at the Chicago plant of The Crane Company have developed a small welding positioner capable of being rotated slowly as the operator welds on a coating of No. 6 Stellite. The disks are preheated before the hard facing is welded on as evenly as possible, with oxyacetylene torches. After welding, the disks are transferred to a box of powdered lime or mica dust so that they will cool slowly and not crack on contracting. The whole operation must be performed with considerable care if hard, non-porous facings are to be obtained.

The positioner consists of a worm-gear speed reducer fitted with a Reeves Varispeed motor pulley and mounted on a Varispeed adjustable base. The gear box is so mounted that it can be rotated around the axis of the worm shaft to permit swinging the work through 90 deg. from vertical to horizontal. Motor speeds are controlled by a pedal so that both of the operator's hands are free to manipulate the torch and rod. The whole assembly is mounted on a channel-iron base equipped with handles so that the unit may be carried to convenient work stations.

Valve disks may be held on a flat faceplate table without clamping, or, where the facing is to be applied around the periphery, in a universal three-jaw chuck.

Using a No. 25 Reeves motor pulley and a 10-in. driven pulley with a 2½-in. flat face, the work table or chuck can be driven at speeds infinitely variable between a minimum of 0.458 r.p.m. and a maximum of 1.37 r.p.m. For faster speeds, the 10-in. pulley is replaced by a 4-in. one. This gives a minimum speed of 1.14 r.p.m. and a maximum of 3.42 r.p.m. when the drive shaft is rotated at 36 r.p.m.

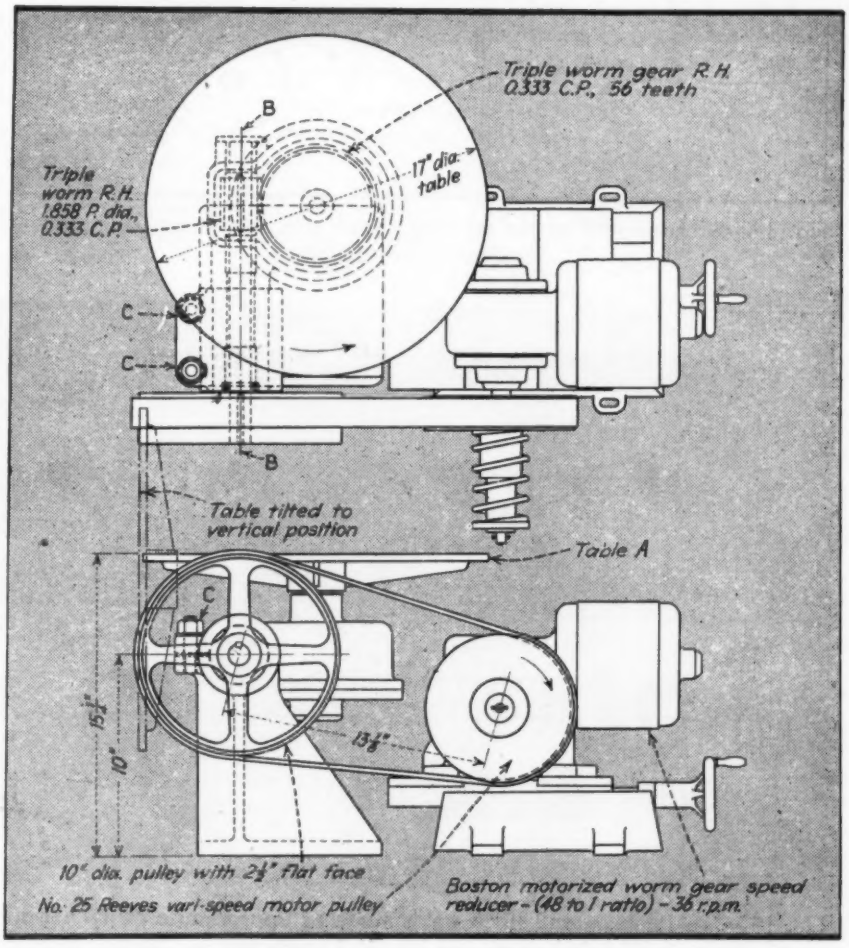


Table A can be swung around axis BB by loosening the two clampbolts C on the stand. With the drive shown, speeds range from 0.458 to 1.37 r.p.m. Any speed within this range can be obtained by simply turning the handwheel on the adjustable base

How to Use Resistance Welding—IV

BY R. T. GILLETTE, WORKS LABORATORY, AND J. F. YOUNG,
ENGINEERING GENERAL DIVISION, GENERAL ELECTRIC COMPANY

A SEAM WELD is a series of overlapping spot welds, which, for convenience, are made with two wheels, or a wheel and a bar, acting as electrodes. The current and pressure are localized at the weld section by reducing the electrode contact area as illustrated in the schematic arrangement in Fig. 14. There are many different arrangements of this type of equipment. On some, the work is fed through with driven wheels; on others, the wheels idle, and the work is driven by the work table or other separate means.

The normal procedure for making a seam weld is to place the work between the wheels, lower the wheels to contact with the work and apply pressure. As pressure is applied, the drive is started, and the welding current switched on. As the work passes between the welding wheels, an "interrupter" turns on the current long enough to heat the work to the welding temperature. Then, at the same time the metal is pushed together, the current is interrupted so that the weld may chill under pressure.

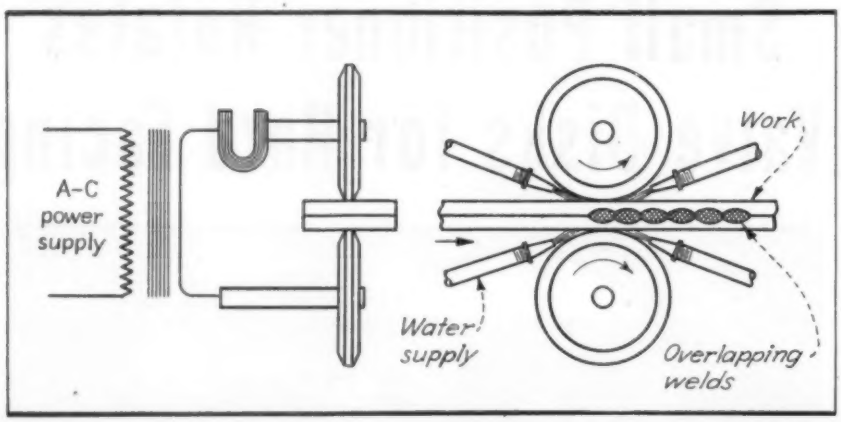


Fig. 14—Arrangement of the welding circuit and wheels for seam welding is shown schematically

The interrupter is in continuous operation, and when the current comes on again, the work has traveled a short distance; the welding cycle is then repeated, making another weld which overlaps the first. In this way a pressure-tight seam is made.

The welding is usually done under water to keep the heating of the welding wheels and the work to a minimum, and thus to give lower wheel maintenance and less distortion of the work.

The use of an interrupter helps compensate for differences in surface condition and thickness of material, and so prevents burns. Highest welding speed is obtained with electronic interrupting control. It also makes possible more uniform welds because of synchronous switching and absolutely the same "on" and "off" time for each current interruption.

When high work speed and long off-time are used, it is possible to space each weld so it does not overlap the previous one. The result is a sort of "stitch" of spot welds. Where this effect may replace a run of spot welds, it can usually be done much faster than with standard spot-welding equipment. Typical seam and stitch welds are illustrated in Fig. 15.

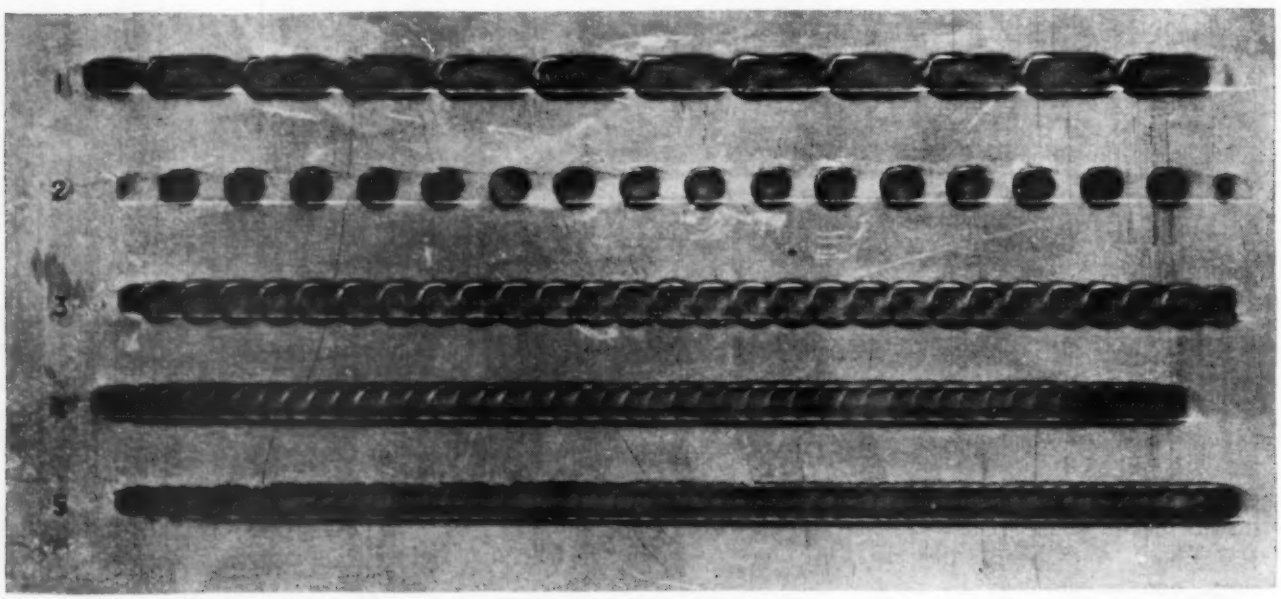


Fig. 15—Typical seam and stitch welds made at approximately 7 ft. per min.: (1) longer "on" period than "off" period; (2) 1 2/3 spots per in.; (3) 3 spots per in.; (4) 4½ spots per in.; and (5) 6 spots per in.

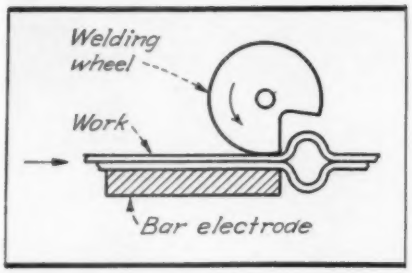


Fig. 16—A notched welding wheel used for seam welding to a header

Seam welding is used on many types of pressure-tight or leak-proof tanks for oil switches, transformers, refrigerator evaporators and condensers, automobile gasoline tanks, aircraft tanks, steam radiators for house heating purposes, paint and varnish containers, large size metal-shell vacuum tubes, all-metal vacuum bottles or containers used for food and hot drinks, milk handling equipment and numerous other products.

The materials that may be seam welded include most all those that may be spot welded. The low carbon steels are perhaps the easiest to weld. Higher carbon steel (0.20 C or more) may be welded, but the quenching effect of the adjacent material and the cooling water may require a subsequent heat-treatment to give ductility to the weld.

The plated steels are welded nearly as easily as the unplated steel, but with both chromium and nickel platings the appearance is marred and the corrosion resistance reduced at the surface of the weld. The protection of galvanizing terne, or tin plates, is also reduced somewhat due to partial pick-up of these platings by the electrode wheels. Copper is almost impossible to seam weld, but most copper alloys and aluminum can be welded at somewhat reduced speed.

Steel plates 3/8-in. thick have been seam welded to hold 3,000 lbs. per sq. in. pressure. But, to date, probably half that thickness is the maximum that has been seam welded on a production basis. As in spot welding, it is possible to weld thin sheet to another part of almost unlimited thickness.

The joints and electrode positions for spot welding are also used for seam welding. However, the shape of the welding wheels should be considered when checking access of the electrodes to the joint. Worn or mushroomed electrode wheels, like spot welding electrodes, must be replaced frequently to obtain quality production.

In some applications, for instance, on refrigerator evaporators, it is desired to weld a seam perpendicular to a large projection or a header. With solid wheel electrodes, this could not be done because of the clearance needed for the wheel, and the remainder of the seam would have to be produced slowly in a regular spot welder. The use of a welding wheel containing a niche to clear the projection, as in Fig. 16, eliminates this difficulty.

The complexity of seam welding equipment naturally depends on the production and the expected life of the design. Fig. 17 shows a four-wheel line welder which was developed for seam welding together two formed halves of a refrigerator condenser. A copper platen is used beneath the work, and the work is fed by a hydraulic table drive. A later design had ten welding wheels and could complete all twenty of the four-foot seam welds on the condenser in two passes—indexing between.

An article on butt welding will appear in an early number.

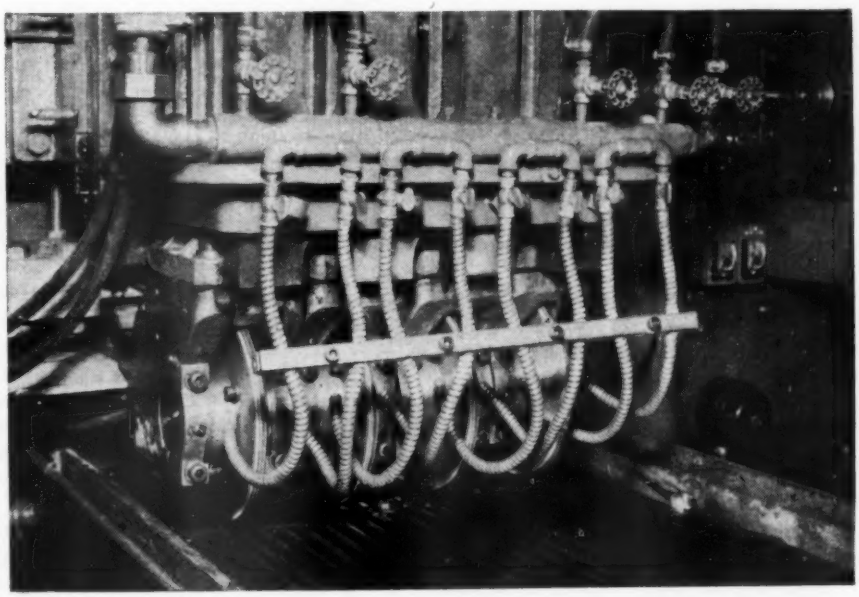


Fig. 17—Parallel seams in a refrigerating machine condenser plates are seam welded using four wheels

High Tool Cost Reduced By Change in Materials

AUTOMOTIVE MANUFACTURERS of aircraft engines have made many significant advances in tooling practice, even though their genius in this direction has been placed somewhat under wraps by the necessity to follow known production methods. But by working on the tooling bottlenecks it has been possible for the industry's master mechanics to cut the cost of perishable tools consumed and reduce tool inventories.

A case in point is the record of tool-expense reduction achieved in machining internal fins in the skirts of aluminum pistons. This is one job that was originally tooled for special-purpose machines in a number of engine plants. More than 100 machines of the double-ended, automatic-cycle type have been supplied by a Detroit machine builder. Some of the pistons finned on these machines have nine internal ribs on each half of the skirt, another size of piston requires eleven ribs. A cutter is required for each groove, and the cutters are strung on an arbor.

The original cutters supplied for this job were made of high-speed steel, cost $12 each. Hence a set of 18 cutters for one model of double-head machine cost $216. Value of the tools installed at any one time on a battery of 20 machines was originally $4320. But over 200 cutters were being completely consumed daily, and the number of pieces obtained per grind was relatively small. Consequently, the investment in cutters to equip the machines, provide new replacements as needed, and cope with the float of cutters being ground amounted to nearly $30,000.

By development of a cold-rolled steel shank fitted with a cast Gorham toolbit, the cutter cost has been reduced to $1.50 each. Tool life is considerably improved. As a consequence, the tool inventory and investment have been sharply reduced, and there is less machine downtime than formerly. The new cutter is much easier to obtain quickly than the former high-speed-steel tool.

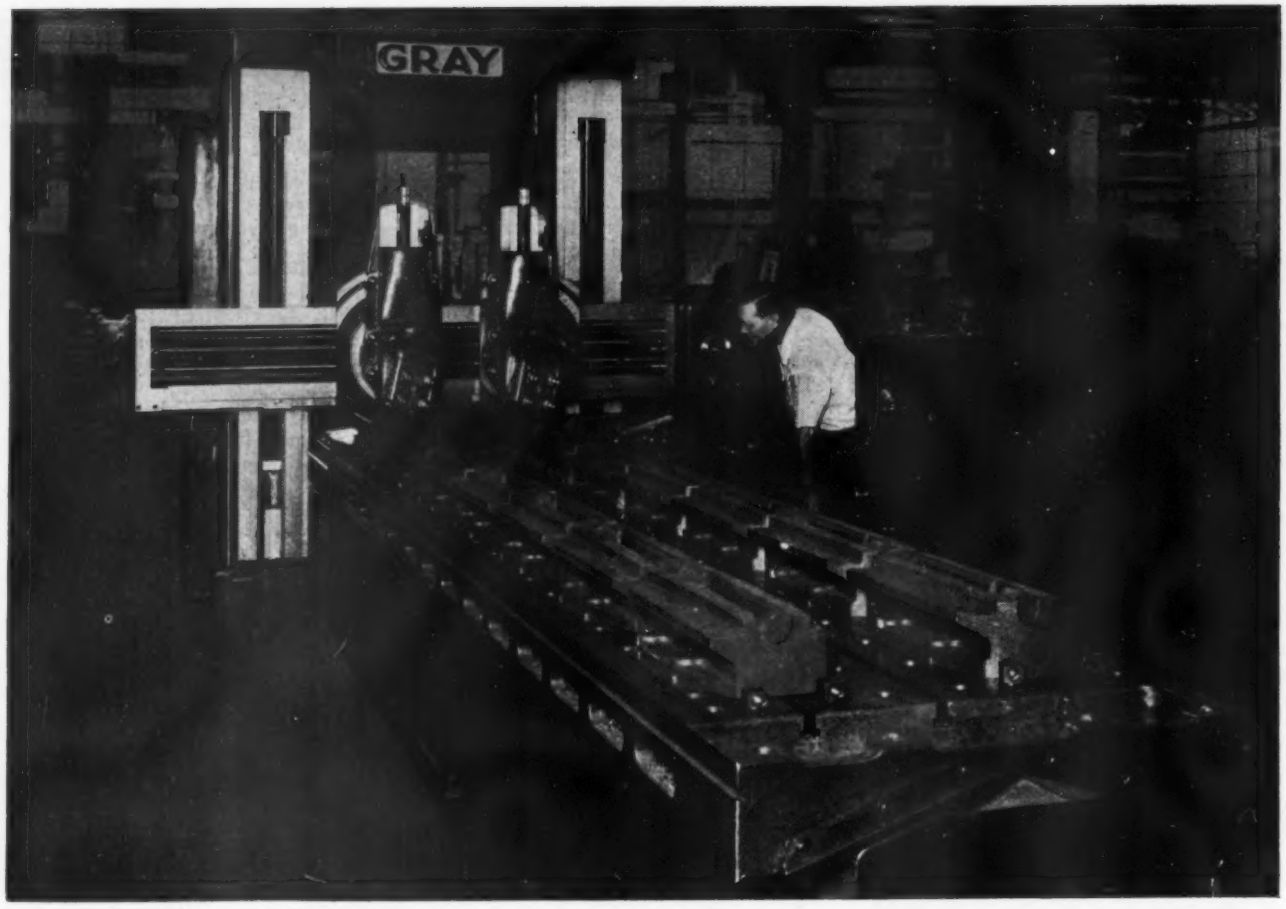


Fig. 1—High planer speeds and carbide-tipped tools are combined in this set-up for roughing and finishing cast-iron machine parts clamped in parallel rows on the planer table

Tools for High-Speed Planing

BY JOHN M. WALTER, CHIEF ENGINEER, THE G. A. GRAY COMPANY

SAVINGS of more than 50 percent in cutting time on planing jobs are not unusual with modern planers which offer increased speeds and faster table reversal after cutting and return strokes. While speeding up operations necessitates proper cutting tools, automatic tool lifters and correct back rake angles, over-all economies greatly offset the time and cost of this equipment and certain required adjustments.

Modern planers with variable voltage drives make possible cutting speeds of 175 to 225 ft. per min. and return speeds of 240 ft. per min. due to the small time lost in slowing the table down to zero at the end of each stroke, and then accelerating to operating speed again. Moreover, rapid table reversals on such units occur without gear knocks as a result of refinements which have been made in the drive gear trains.

Are you getting the best from your planers? Selection of the proper tools and the methods of sharpening will make efficient producers of modern equipment, and will offset any added cost

Difficulties which once faced use of carbide-tipped tools for planing at such high speeds have been successfully overcome by careful analysis of cutting conditions for different applications, including feed and speed, depth of cut, and the nature of the job. Thus, more efficient cutting action and reduced tool cost is possible in spite of the intermittent cutting action and heavier cuts involved in most planer work. However, this is possible only with strict adherence to the necessary tool shape, and rake and clearance angles determined for a particular job. Also important is the proper control of the manufacture and maintenance of the tool, which preferably should be ground in the tool department and not by the planer operator.

When using carbide tools on planers, automatic tool lifters are essential for lifting the tool on the return stroke so that it is not dragged back over the work and its cutting edge thus dam-

aged. To prevent such tool drag at any time, tool lifter action must be synchronized with the movement of the table, so that the tool is not lowered onto the work instead of ahead of it at the start of the cutting stroke, and the tool begins to lift immediately at the start of the return stroke. Sufficient overtravel time must be allowed at the start of the cutting stroke to let the clapper block seat firmly and gently, otherwise the slide will creep slightly and affect the accuracy of the tool setting. Since many planers now in use are not equipped with tool lifters, they could not employ carbide-tipped tools, even if their table speeds were increased.

Small iron castings, such as those shown in Fig. 1, are planed throughout with carbide-tipped tools. These parts have dovetail guides requiring accurate planing to provide a precision fit. The depth of cut for the first roughing cut will vary, but the maximum depth is not over 5/16 in. Tool life between grinds is satisfactory with a cutting speed of 175 ft. per min., using 0.047 in. feed per stroke.

Breaking out of the cast-iron, as the tool nears the end of the cut on each piece, is not objectionable under these conditions. The castings are sufficiently rigid to withstand the pressure of the cut and to permit the heavy clamping necessary to hold them on the table. If the castings were of a fragile nature, a lighter feed and less depth of cut would be necessary, but the speed might then be increased.

Finishing Cuts No Problem

The second or "straightening" cuts are approximately 1/32 to 3/64 in. deep, and are planed with a cutting speed of 225 ft. per min. while using a feed of 0.047 in. per stroke. These cuts are, of course, very light and there is no question regarding tool life.

For the finishing cuts, a cutting speed of 150 ft. per min. is used with $\frac{3}{8}$ in. feed per stroke. The maximum return stroke speed, 240 ft. per min. in this instance, is used for all operations on these castings.

Details of the tools used for planing these castings are shown in Fig. 2, and the application of the various tools is shown in Fig. 3. Shanks of the tools are made of medium carbon steel, and the carbide tips are brazed in place. Roughing tools *A* are used for the horizontal surfaces, and must be made in right- and left-hand styles as shown in Fig. 3. These tools have 15 deg. side and end cutting edge angles. Back rake is zero to better absorb impact of the intermittent cut caused by the space between the castings, which must be left for clamping and end stopping.

Fig. 4 illustrates the effect of changing the back rake angle. When there is a positive back rake angle, impact as the tool starts to cut occurs on the point of the tool which is thus damaged in a short time except for extremely light

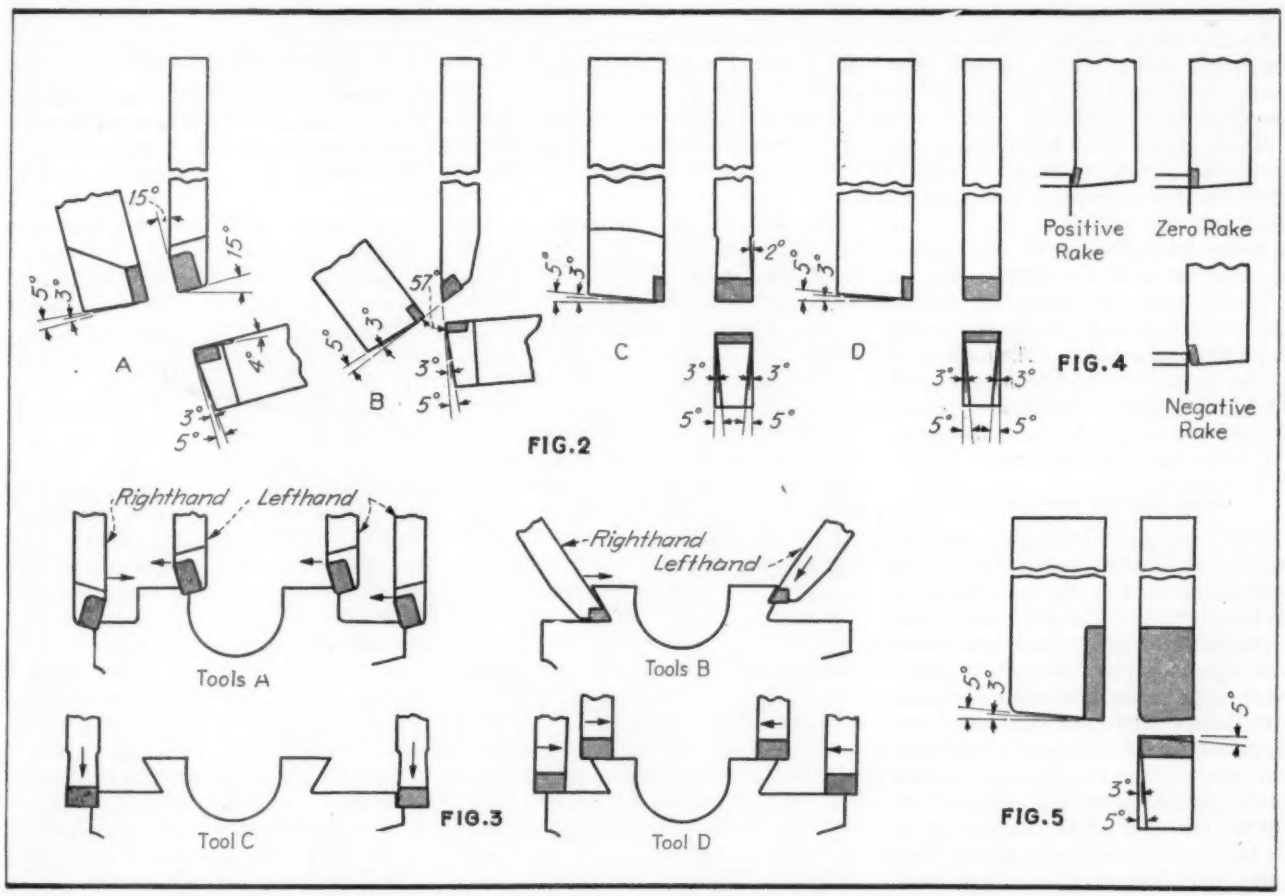


Fig. 2—These four standard carbide-tipped tools work well when rough planing cast iron surfaces at high speeds if the depth of cut is not too great. Fig. 3—Tools shown in Fig. 2 are set up in the above manner for planing various surfaces on the castings shown in Fig. 1. Roughing cuts with these tools are made at 175 ft. per min. with a 0.047 in. feed per stroke and about 5/16 in. maximum depth of cut. Fig. 4—These sketches illustrate the effect of grinding positive zero or negative rake angles on planer tools. Tools with zero rake or with negative back rake angles give best results. Fig. 5—When planer tools are tipped with a cast alloy, the cutting edge angles shown work well

cuts. A zero back rake angle gives very good results for light and medium cuts, since the impact occurs along the cutting edge to the extent of the depth of the cut, and the yield of the tool and of the metal being cut tends to distribute the impact load equally along this part of the cutting edge. With a negative back rake angle, the impact occurs away from the point of the tool, and this sometimes improves tool life, particularly on heavy cuts.

Negative back rake angles should be kept at a minimum because the greater the angle, the greater the pressure against the tool and the greater the end thrust on the tool will be. Usually a negative back rake angle of 2 or 3 deg. will be sufficient to distribute the impact pressure to the best advantage. It must be borne in mind that the back rake angle must be considered in relation to the surface of the work as the tool starts to cut. If the end surface of the work is at an angle, the back rake angle must be adjusted accordingly.

A side rake angle of 4 deg. and cutting edge relief angles of 3 deg., with secondary relief angles of 5 deg., as shown for tool *A* in Fig. 2, will give good results for rough planing cast-iron and free cutting steel.

Tools *B* are used for planing the dovetailed surfaces as shown in Fig. 3. These tools must be made in right- and left-hand styles. Tools *C* are used for squaring down the sides of the castings, and can be used for either right- or left-hand cuts. *D* tools are broad, square-nosed finishing tools used on the flat, horizontal surfaces. The tools used for the second or straightening cuts and for finishing the dovetails are ground to the same angles as those shown in Fig. 2 for the roughing tools.

Feed Should Be Uniform

When using carbide-tipped tools for planing, it is essential that there be no appreciable variation in the amount of feed per stroke. The feed movement of the heads is driven by a mechanism which provides for intermittent movement, because the feed must occur before the cut starts and must not occur in the cut. If the feed drive overtravels, and thus moves the head a distance much greater than the amount intended, the edge of the tool is apt to be damaged in one stroke alone. Carbide-tipped tools are much more sensitive to variations in chip thickness than are high-speed steel tools.

Due to the greater accuracy required from the feed mechanism, and to the increased speed at which the feed must operate, it has been necessary to develop a new feed mechanism around different principles than those formerly used. The time interval during which the feed cycle occurs is small. Except for the coarse feeds used for broad finishing cuts, the feed movement is completed during a few inches of table travel. It will be apparent also that the feed movement must be closely synchronized with table movement for correct operation.

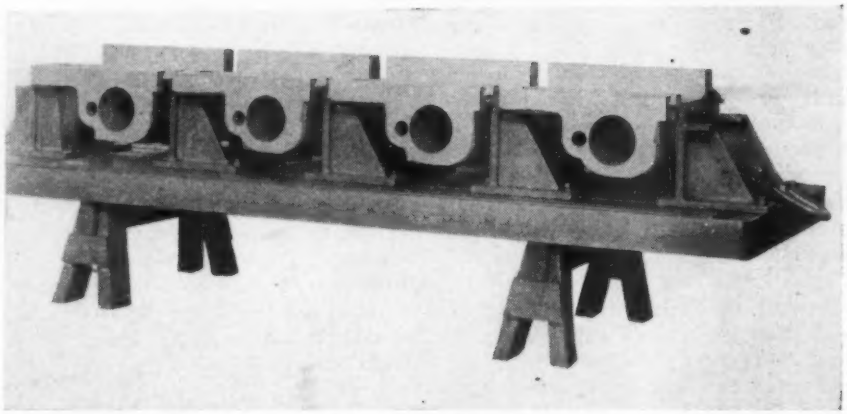


Fig. 6—Idle time of the planer can be reduced materially if work is set up on a separate plate, like the one shown, while the planer is being used for other operations. When one job is finished, it is a simple matter to interchange transfer plates on the table of the planer

It is well known that carbide-tipped tools become dull rapidly when vibration occurs at the cutting edge. Planer heads must be maintained in snug adjustment, as any looseness in the various members which make up the head may cause vibrations or reduce damping of the vibrations. The heads, cross rail and planer housings must be amply rigid to minimize vibration.

Extremely large castings will, in nearly all cases, require a large depth of cut on the first planing operation. Castings of such size are seldom straight, and are apt to be warped considerably. If the surface is to be cleaned up in one cut, in order to get under the scale as much as possible, the depth of cut may be an inch or more in some places.

Carbide-tipped tools, in their present state of development, are not always economical for these heavy cuts. However, tools with cast alloy tips, such as the one shown in Fig. 5, are very satisfactory for such work. With these tools, cutting speeds from 75 to 95 ft. per min., with a feed of from 3/32 to 1/8 in. per stroke, will give good tool life between grinds. Such tips are made large to permit many regrinds before a new tip must be fitted to the shank. Usually, it is necessary to grind off a considerable amount of the tip when sharpening such tools, because the cutting edge will become quite jagged from the extremely heavy cuts. In some shops, high-speed steel tools are used for such heavy cuts, with feeds up to 1/8 in. per stroke, but with cutting speeds reduced to about 35 to 50 ft. per min. Maximum return speeds are, of course, used irrespective of the cutting speed.

Repack After Roughing

Roughing cuts which remove such a large amount of surface metal release internal strains distorting castings. After taking the roughing cut it is, therefore, necessary to relieve the hold-down clamps so as to avoid holding the casting under a strain. The castings should then be reset and repacked before it is reclamped to the table. Straightening cuts are then taken to level off the torn and rough surfaces left by the heavy roughing cuts. Carbide-tipped tools are ideally suited for such cuts. These cuts, taken at high speeds, do not develop appreciable warmth in the surface being planed, and greatly reduce distortion resulting from cutting heat. Final finish planing cuts are made on these castings after boring and drilling operations are completed, as strains in the castings are also affected by these operations.

A remark frequently heard about present day planers is: "You seldom see them cutting, always setting up." However, the set-up time can also be minimized in planing small or medium-sized pieces by using holding fixtures, or better still, holding fixtures mounted on set-up plates, as shown in Fig. 6. It is easier to set up the pieces on such plates and then place the loaded plate on the planer table. Moreover, the use of two plates for a planer can considerably increase output, since one load of castings on a set-up table could then be machined in the planer, while a new load is being lined up on the second plate nearby.

Rope Slings—A Few Good Pointers

By C. R. HOCHMUTH, KEARNEY & TRECKER CORPORATION

THE IMPROPER USE of wire and manila rope slings can exact a high cost in accidents to your men and production time for your shop. When a sling breaks, the injury to men and materials may be irreparable; when a sling is misused, finished parts may be so marred as to be turned to scrap. In using slings to handle such varied materials as steel rods, rough castings, finished parts and assemblies, we have learned a number of valuable safeguards for the protection of personnel and equipment.

First choose the right sling for the job, keeping in mind that the sling must be as easy to manipulate as possible, that it should not be damaged by sharp corners on the load, nor damage finely machined surfaces, and that it be easily inspected. These factors will vary with individual applications.

When handling finished parts, manila rope should be used. To protect manila rope slings from rot they should be hung in a dry place, allowing air to circulate freely around them. Before being used, they should be carefully inspected for wear, and they should be taken out of service as soon as a reduction in strength is revealed by broken strands or other damage.

Where the sling does not come in contact with polished surfaces, a wire rope sling—preferably of preformed rope—should be used. New rope, or rope in first class condition, is necessary, as wear makes the factor of safety questionable. Rope which will not "barb" when it becomes worn should be chosen in order to minimize the risks in handling the sling. These barbs, which are ends of broken wire sticking out from the rope, can cause deep puncture wounds or lacerations that are especially liable to infection. Preformed rope has the advantage that it does not tend to barb when wear takes place; the broken wires lie snug against the body of the rope and do not straighten out and project. However, this in itself may be dangerous in that wear is not immediately apparent and the sling may break without warning.

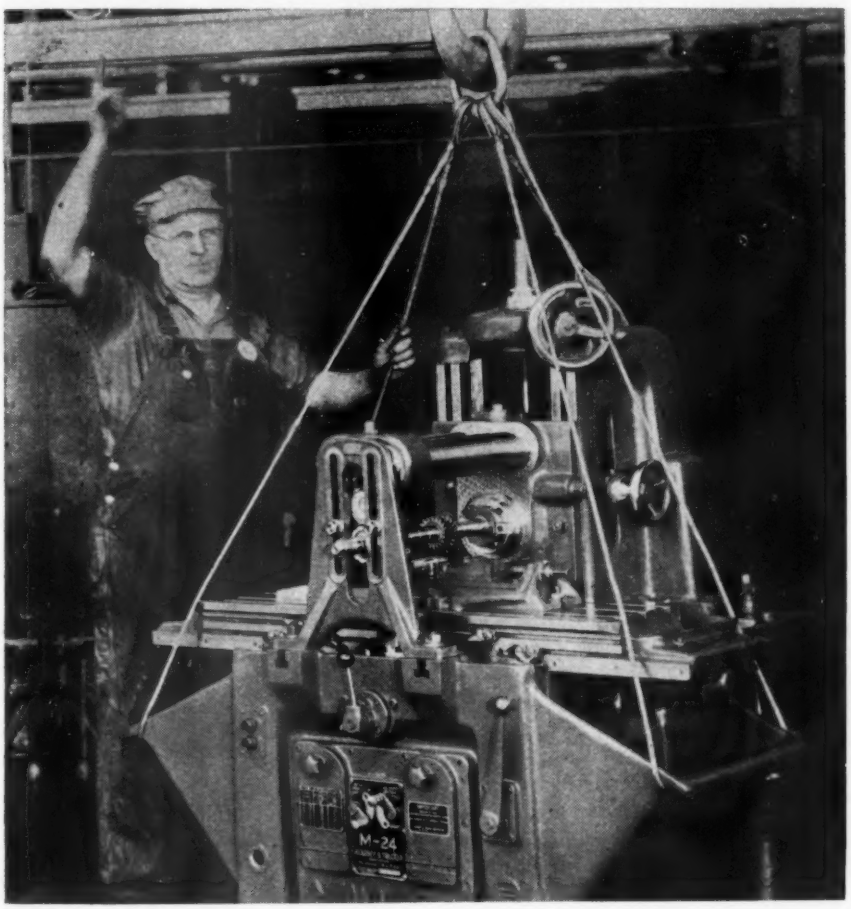
Slings with spliced eyes or loops are preferred to slings having clip fastenings. Since an improperly made splice may be only half as strong as one correctly made, all splicing should be carefully done by well-trained men. Wherever possible, we use thimbles to reinforce the spliced eye, to prevent distortion of the eye or bight by the lead.

Where the strands of rope are cut off after splicing, they present a hazard to those handling the rope. This danger can be eliminated by serving the entire splice with soft annealed wire, covering the exposed ends of the strands. After the serving is applied, just enough solder is used to keep the serving wire from unwinding in case it should become broken.

The tendency of slings to twist up can be minimized by the use of preformed rope, which lies straight and does not tend to kink or loop. The sling can thus be more easily attached and detached, especially those consisting of two or more ropes attached to a common ring or link where considerable time may be lost in disentangling them every time they are used.

Most slings are normally subjected to severe service, but safety and economy demand that unnecessarily hard usage be avoided. If possible, the rope should not pass over rough corners on the load, but where it must, it should be protected. No rope should be dragged over a concrete floor. A wire rope sling may be quickly ruined by such practice, especially where it consists of several ropes. When the free end of the rope is allowed to drag, severe wear usually results along one side of the eye, causing the rope to fray so that it must be replaced.

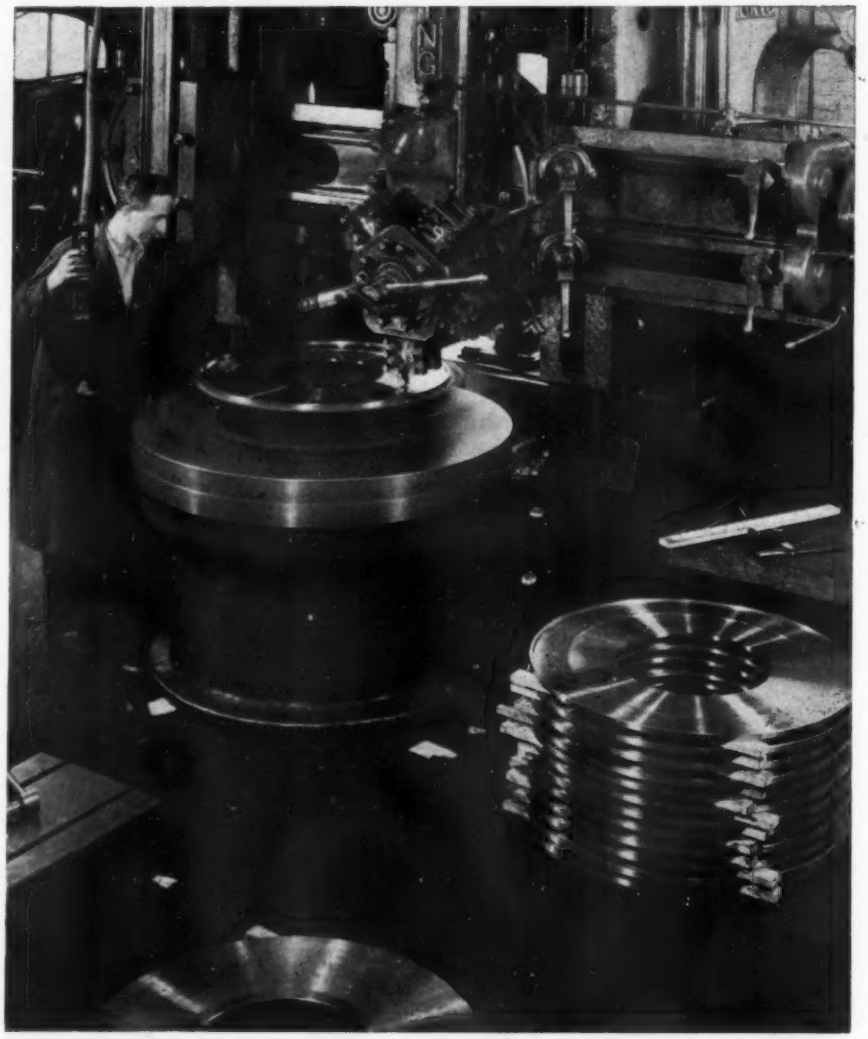
In order to protect finely finished drilled holes in handling cast milling machine bases in our plant, round maple rollers are run through the holes, until they extend several inches beyond the sides of the casting. Manila rope slings are then hooked onto the ends of the rollers. The ends of the rollers, which are 1½ to 4 in. in diameter, are marked with a streak of paint to show the direction of the grain. Before the load is raised, the rollers are turned until the paint marks are vertical so that the stress will be parallel to the grain of the wood.



Conversion of a Machine Tool Plant

BY WALTER K. BAILEY, VICE PRESIDENT, WARNER & SWASEY COMPANY

Most plants on war production converted their facilities months ago. But machine tool builders were kept busy until recently on demands for their regular products. Changing over at this late date posed special problems



This vertical boring machine formerly made turret lathe saddles. Now it is devoted to machining clutch plates for Victory ship power transmission

UNTIL NOW in the war production program, work has been looking for equipment. Now equipment is looking for work. The very people whose equipment was needed for the war effort—the machine tool builders—now find part of their own machine tools looking for jobs to do.

The problem faced by our own company was our realization early this summer that by October our production of turret lathes would probably be down to a fourth of the July 1 level.

In seeking work to occupy our equipment on behalf of the war effort, we adhered to the principle that every available machine tool should be used for war production.

We determined, therefore, to take into our plant types of work which would, insofar as possible, fit our existing equipment and not require the purchase of any new machine tools. This meant we would have to be careful in the selection of work, because the sum total of the work had to be balanced in proportion to the availability of equipment in our plant.

First of all, we had to make sure that a certain portion of all of our equipment would remain free and clear for the production of such turret lathes as would still be required for the war effort. The job then was that of securing for machines remaining over and above turret lathe requirements, work of the volume and type which those machines could do.

These considerations meant ruling out in the very beginning the taking on of volume production of any one item, for any such proposition would not be in balance with the equipment available and almost certainly some new machine tools would be required whereas others which we now possessed would not be needed and would be displaced.

The problem, therefore, developed into one of selecting, from the multiplicity of subcontracts offered to us, those of proper size and diversion to accomplish our particular purpose.

The immediate requirement was to fit these new projects into the taper-off period as efficiently as possible. As production ebbed through our plants, about 400 machine tools were released between July and September for application on subcontracts. Assembly space began to become available about last August 15 and increased to 100,000 sq.ft. as of October 1.

As the first selection to employ all our facilities and trained personnel continuously on war work, a subcontract was accepted for production of heavy diesel engine crankcases. These are used aboard submarines and destroyers. The project absorbed much of the plant equipment formerly required on beds for our turret lathes and included such of the larger items as planers, horizontal boring mills, radial drills, planer-millers and large milling machines.

A contract to supply clutches for one

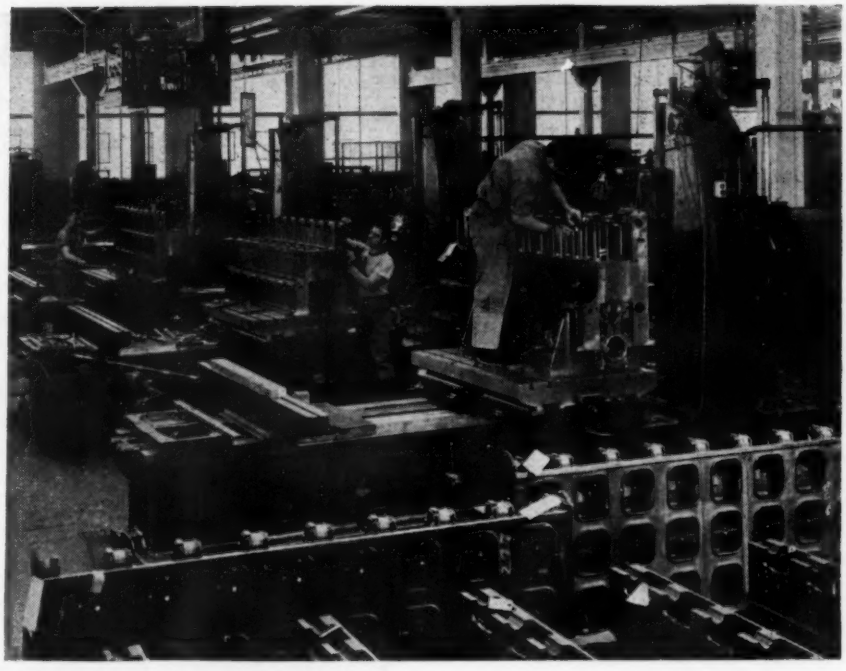
of the highly successful liquid-cooled, in-line aircraft engines appeared most suitable to occupy equipment formerly devoted to machining small turret lathe gears. This included most of our small drill presses, grinders, gear cutters, turret lathes and the like.

A survey of further possible projects led us to include a sizable order for power drives for anti-aircraft guns. This project took up most of the slack in machining capacity normally used on gears, gear boxes and aprons for our turret lathes. It re-employed the majority of internal and external grinders, medium gear cutters, gear grinders, horizontal boring mills, milling machines, lathes, and small and medium turret lathes.

While these three subcontract projects have been mentioned in relation to the kind of turret lathe production ordinarily accomplished with the equipment and craftsmen required by them, it is obvious that the machining sequence is far from identical. In fact, it is only insofar as the general size of equipment is concerned that such relationship is apparent.

When the new operational routing was computed and projected against available machining capacity, there was room for yet another major project.

A subcontract for service parts for aircraft pumps was accepted, which absorbed most of the remaining time on surface grinders, external grinders, horizontal and vertical milling machines, and medium turret lathes.



A battery of horizontal boring machines is busily engaged on crankcases for marine diesels. Ordinarily turret lathe beds are machined on this equipment

When each of these new projects, in its turn, reaches maximum output during the three months period beginning next February, approximately 75 percent of all our machining capacity will have been absorbed.

The remaining margin fits current forecasts for continued turret lathe demand, for which some 25 percent of the capacity of each size and type of machine must be reserved.

It was inevitable in a conversion of this extent that some change-over in equipment became essential. We were careful, in the main, to select jobs requiring operations that correspond to operations performed in the making of Warner & Swasey turret lathes, however varied the sequence of such operations might be.

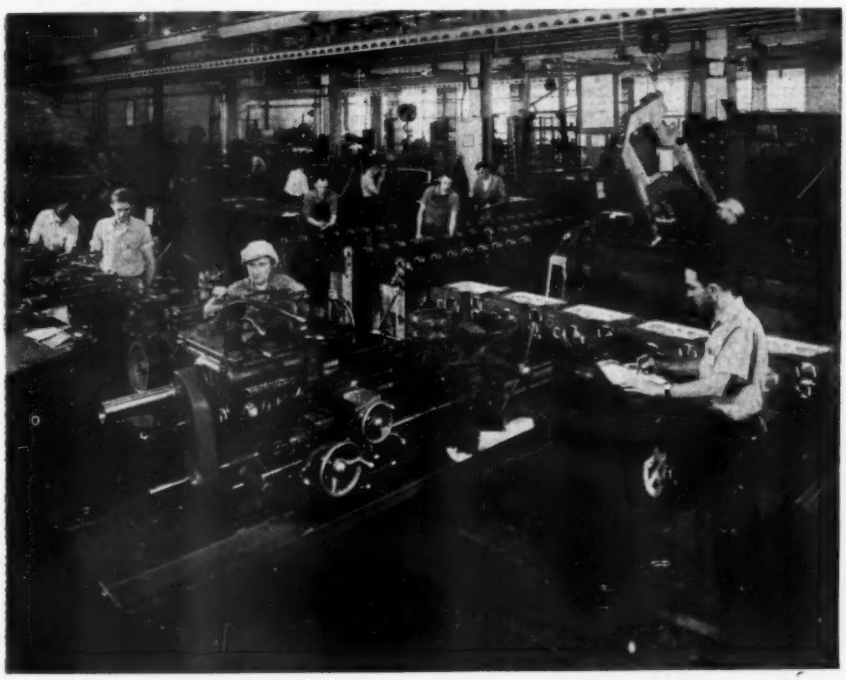
By making this our main point of concern, the entire change-over to a new production load for some 400 machine tools in our plants was accomplished with a minimum change in equipment amounting to only ten percent.

Some Equipment Exchanged

Holding to our premise that no new machine tools would be purchased, exchanges were arranged with prime contractors with whom we were dealing.

As an instance, a single piece of their equipment, when moved to one of our plants and supplemented by additional machines available there, completed the pattern of operational sequence needed to handle production on a given part.

Again, we found it feasible to swap an item of our equipment, which soon would fall in the excess category, to a prime contractor who would put it to immediate use. He, at the same time, equipped us with units which rounded out our capacity to undertake an extensive subcontract job for him.



Turret lathe assembly continues on a reduced scale while the balance of the floor space in this department is given to inspection and storage of diesel engine crankcases and chain housings

In this way, existing machine tools, including our own, were brought back into efficient use without recourse to the purchase of new equipment.

The effect of this was to increase slightly the total of our machining capacity, but the program, as outlined, fairly well takes care of this phase of our long-range conversion problem.

Remaining is the full utilization of our available assembly space and our immediate need to fill in with odd lot orders until these four major subcontract projects can reach maximum production.

As mentioned, this will not occur for several months. The lag was occasioned by engineering and tooling requirements for each.

In the interim, we are, for instance, devoting the capacity of five turret lathes for four months to production of parts for bomber turrets. Similarly, three turret lathes and three grinders are occupied on a sizable order for engine bearings.

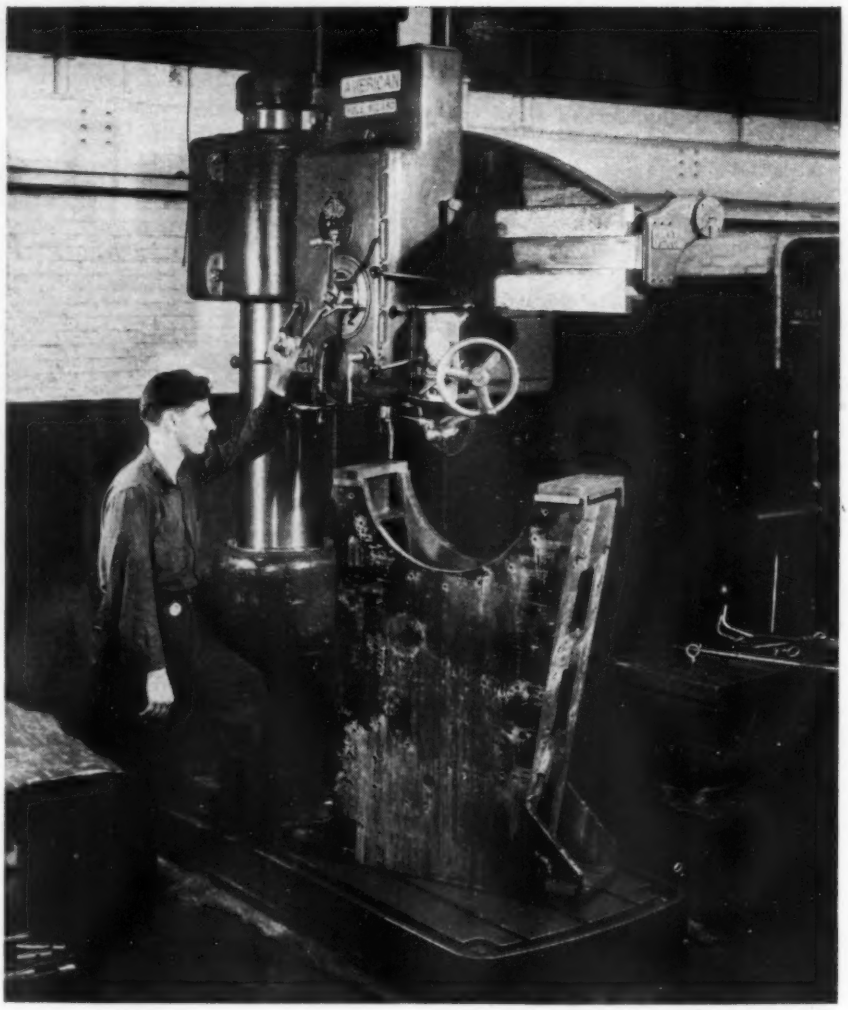
In the aggregate, our conversion efforts, including short-term jobs such as the above, have led to our manufacture of parts for marine steam engines, directors for anti-aircraft guns, naval torpedoes, crankcases and a number of assemblies and accessories for diesel engines used aboard mine sweepers, destroyers and submarines, parts for landing field construction equipment, hydraulic gun controls, chemical bombs, aerial cameras, airplane fuselages, a steel rolling mill for Russia under Lend-Lease, marine cargo hoists, aircraft bomb-loading jacks and supercharger drives for high-powered, liquid-cooled aircraft engines. The current list is too long and too diverse to be given specifically here.

Nevertheless, it is evident that, in our effort to find products and jobs that together balance up to use the capacity of our plants, we have undertaken a sizable range of new work. To avoid ultimate conflict, it was necessary that we take particular care in our planning of each project not to overload a given type of machine at any time, now or in the future.

Machine Balance Sought

A chart was devised on which the total of machine hours for each type of equipment is visually plotted. This chart represents the overall jig saw pattern of machine capacity and subcontract requirements involved in the change-over from production of turret lathes to other essential war products.

Item by item, each unit of equipment is listed on this chart in vertical columns at the left. The sequence of calendar days is represented by a series of adjacent columns, so that machine-hours for each unit can be blocked in according to work schedules.



A chain housing for a marine diesel engine is drilled on a 4-ft. radial. Formerly this equipment was kept occupied on machine tool parts

In this way, the time at which any lathe, boring mill or other item will have completed work currently assigned represents a chink in the overall jig saw pattern, which must be filled by procuring in advance a minor subcontract or job lot order suitable to the capacity represented.

By summing up the potential idle machine time throughout the plant, as of a given date, our capacity at any period to undertake new jobs is indicated.

Finding projects to absorb the use of our assembly space has been the most difficult phase of our conversion problem. This results from the fact that perhaps no other line of manufacturing requires as much assembly work as machine tools.

Of 100,000 sq.ft. of assembly space available as of October 1, from 30 to 35 percent is reserved for our continued production of turret lathes. Present forecasts indicate that this will be sufficient to our needs.

Rapidly absorbing another 25 to 30 percent is the increased rebuilding of Warner & Swasey turret lathes. These are machines that have been long in service and are being returned from the field.

The volume of such reconditioning that can be undertaken is limited by the number of available skilled craftsmen. It is obvious that greater skill is required to recondition a machine tool than to produce it originally from raw stock by a fixed sequence of operations.

If we are to avoid adding new equipment, two alternatives remain by which our surplus assembly area can be put to use. Either a subcontract must be found for assembly work alone, or a prime contractor in position to supply a good part of his own equipment must be dealt with. Projects of both these types now are under consideration. Whichever is selected will complete the general pattern of our conversion.

Effective Control of Shop Gages

BY L. W. MACOMBER, TOOL AND GAGE SERVICE SECTION,
GENERAL ELECTRIC COMPANY, LYNN RIVER WORKS

One-man control for all gages used in shop or inspection area features complete up-to-date information on all checking tools

PRECISION MANUFACTURING requires that gages and measuring instruments be accurate and it is readily apparent that to maintain constant accuracy a system for the periodic inspection and control of these instruments must be provided. Such a system, which is highly satisfactory, was developed by the collaboration of the tool and gage service section and several planning sections at the General Electric Company, River Works.

Under this system control starts in the planning department with one man assigned to plan and maintain its operation in the shop and gage inspection areas. This man determines the number and type of gages used in the department, orders new gages, arranges for repairs of worn gages, controls gages in toolcribs, shop and inspection areas and controls movement of gages to and from gage inspection. He consults inspection and shop supervision heads in determining the type and number of gages to be used.

Gages under his control include all measuring tools such as special templates, thread gages, plug gages, snap gages (fixed and adjustable), micrometers, vernier calipers and sometimes jigs and fixtures.

The first step in starting this system on a job already operating is to take an inventory of gages on hand, their location, and incorporate them into the system. Surplus or worn gages are removed from the job and each gage in service etched with a serial or code number to distinguish it from any identical gage.

A survey of the job is then made to determine the number and types of gages required. In determining the number of gages required to maintain production, allowances are made for periodic inspections. A spare gage is included for factory use during the time active gages are being inspected and adjusted.

In determining the intervals of inspection, tolerances allowed and frequency of use must be considered. At the start, an arbitrary period between inspections is assigned to each class of gage. This period is modified as experience dictates. Each type of gage or measuring tool has a definite period assigned to it based on the foregoing and is left available for use in the manufacturing department for that period.

Records of all gages and measuring tools on hand must be accurately kept and a chronological index maintained so a specific gage will be picked up and inspected for wear or damage at the end of its prescribed interval. This may be done by using a visible card file and signal tabs. A standard file, such as we use, has 12 drawers containing 63 individual pockets, each of which will accommodate three cards. This permits 756 different items being carried in each file and each item may be in duplicate or triplicate. Two or more pockets may be used where there are many of the same item.

A typical card shows the necessary information to identify the gage, such as production and tool drawing number for special gages or the size and type on standard tools such as micrometers, plug gages or thread gages. The code serial number is in a prominent place on all cards. Space is provided for recording inspection dates and location of gage after each inspection.

Numbers on the bottom of the card correspond to the days of the month while the colored signals designate the month of the year. The colors of the signals conform to an established standard code of the standards department

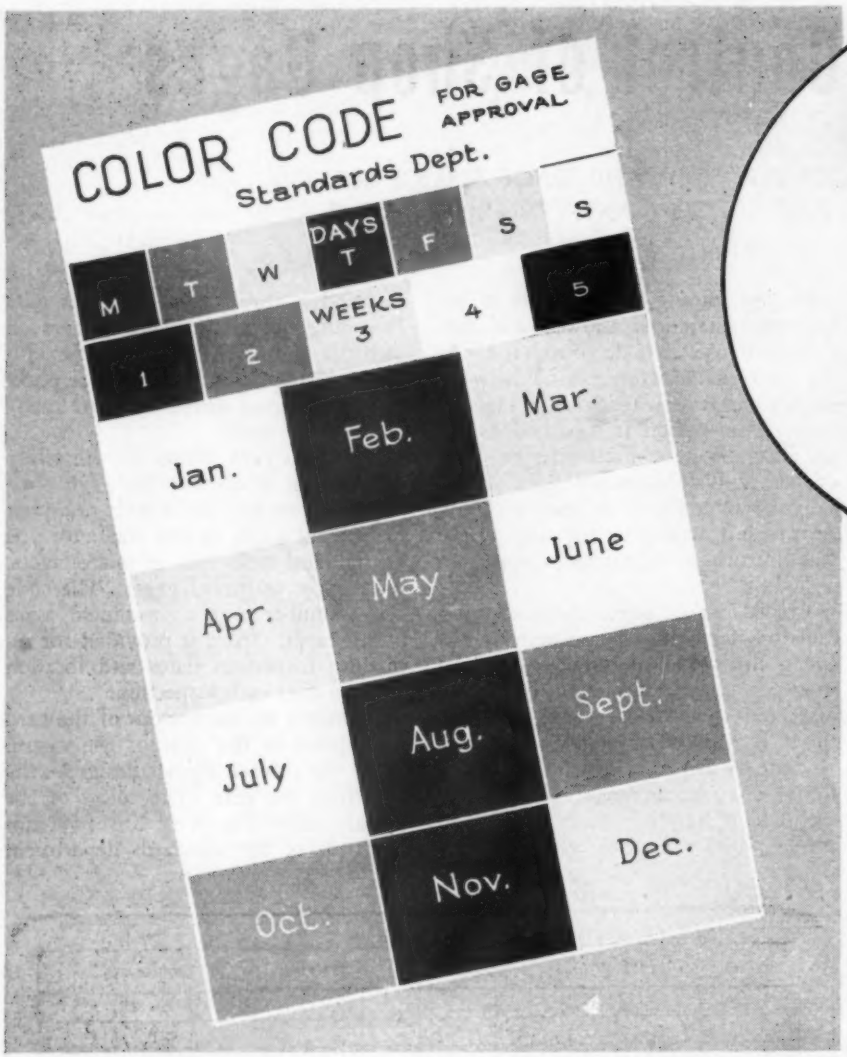
P-1926 11-10-42 INSPECTION AREA "B" SHOP "M"

Date Insp.	In Use Location	Date Insp.	In Use Location	Date Insp.	In Use Location	Date Insp.	In Use Location	Date Insp.	In Use Location
1-7-43	1-7B								
1-22-43	1-22-M								
2-5-43	2-5B								
2-20-43	2-20M								
3-6-43	3-8B								
3-22-43	3-22M								

Produc Drawing 6652768 3.747 3.753 Code No. DLXVI

1 2 3 4 7 8 9 10 1 2 3 4 5 6 7 8 9 20 1 2 3 4 5 6 7 8 9 30 31 Tool Drg. 1072558-3PT 72

Typical file record card showing inspection dates and location at various times of the gage below. Tab at bottom of the card is the control signal



Color charts giving codes used in marking gages are posted in toolcribs, inspection areas, and used by supervisors so that proper color for the period may be recognized

(January, white; February, purple; March, yellow; April, light green; May, red; June, light blue; July, pink; August, dark green; September, dark blue; October, tan; November, brown and December, gray). Example: A light green signal set on the number five indicates April 5. From this, gage control would know that on April 5 the prescribed interval had elapsed for this particular gage and should be replaced by a recently inspected gage. Additional replacement gages are immediately etched with code numbers and recorded on receipt in the department. A perpetual running record of code numbers is kept separately and the next highest consecutive number is assigned to each new gage.

After the cards are properly made out gage control distributes the gages to locations where they are needed. Usually one or more goes to the toolcrib, one to the inspection area, and the third to the spare cabinet. The cards are then filed in the file accordingly. The spare file is set up in the same manner except that no signals need be used as the gages are not active.

Each day gage control removes the cards from the active file, toolcrib section, which are flagged for inspection for this day. Cards for corresponding gages are removed from the spare file. The spare gages now become active and the date and location are entered on the card under "In Use Location." Gage control next removes gages from the spare cabinet corresponding to the cards taken from the spare file. These spare cards now replace those taken from the active file within the toolcrib section and new crimped signals are set for the next inspection date. If the file pocket contains several cards, the new card is inserted behind the others and the signal moved forward to the next inspection date of the outermost card.

Gages taken from the spare cabinet are now taken to the toolcrib, together with the cards taken from the active file. At the toolcrib spare gages are left to replace those gages due for periodic checks. These are picked up and sent to the standards department for examination.

Gages found correct on return from the standards department, become spares and are available for exchange with those being used by the inspection group. This exchange is made and cards are properly recorded and filed in the inspection section of the file. Gages removed from inspection are sent to the standards department and if found accurate are placed in the spare cabinet to await the end of the next interval. If a gage is used exclusively as a shop gage and not used by inspection or vice-versa, the procedure is cut in half.

Any gages found defective and rejected by the standards department are returned to gage control where the corresponding cards are marked "Defective" and the dates entered. Orders for repairs are immediately made out by gage control and sent with the defective gages to the tool and die department for repair. The serial number of the repair order is entered on the cards which are filed in the spare cabinet under a caption of "Gages, Defective, Being Repaired." When repaired gages are returned, they are checked by the standards department, and placed in the spare cabinet until needed. Dates of inspection are noted on the cards.

Recording the dates inspected, the dates put into use, and the dates when found defective give gage control an

accurate record of each gage's use. This record of experience is the determining factor in deciding the inspection interval for any particular type of gage and is varied accordingly.

Gage control must be notified, by a "Change in Design Notice," of all changes which affect the dimensions of a gage or cause it to become obsolete or scrapped in favor of a new type of gage. Records must then be changed accordingly and gages disposed of as indicated in the change notice.

When a gage is checked by the standards department and found to be perfect, their approval is indicated by painting one or more spots of paint on the gage itself. This paint is applied to a particular part of the gage that is subject to minimum handling. A larger spot is the color for the month and a small spot designates the week. When necessary, a third and smaller spot is applied to show the day of the week. This serves as a ready reference to inspectors or foremen, who are supplied with a color chart, and verifies that the gage control is operating efficiently.

If there are several spares in use, it is possible they remain in the spare cabinet for a considerable period of time causing the paint to become outdated. Gage control, in this case, takes the gage to the standards department and the paint is brought up to date.

Metal or wood color charts are distributed to inspection areas, toolcribs, and supervisors so that the proper color for the period may be recognized. Colors used for each period are:

January, white; February, purple; March, yellow; April, light green; May, red; June, light blue; July, pink; August, dark green; September, dark blue; October, orange; November, brown; December, gray.

First week, brown; second week, gray; third week, yellow; fourth week, white; and fifth week, black.

Monday, purple; Tuesday, dark blue; Wednesday, pink; Thursday, red; Friday, orange; and Saturday, green.

One person in the standards department is responsible for distributing the proper colors to the inspectors. Colors are applied on a fiscal month basis; that is, when a month begins with Thursday, Friday or Saturday, these days are considered as part of the last week of the previous month.

Variation to meet the needs of the individual shop may be incorporated into this system without changing the fundamental procedure. The system is adaptable to filing by size alone as in the case of micrometers and simple measurement "Go and No Go" gages such as cylindrical plug gages. In a shop where several sizes and types of only one item are made, tabulated tool drawings are usually made of each type of gage and the different sizes are denoted by part numbers. The part numbers denote the production drawings for which they may be used. In some shops which make one finished product composed of many component parts, each individual part is identified by a separate production drawing. In this case, each production drawing would have a file drawer assigned to it and the cards of the gages used for that drawing would be filed within.

Simplicity and absence of error are features of the system. The quantity on hand, location of each individual gage, the date last inspected and the average life of each gage is available to anyone at any time. The set-up is simple and the system is not readily disturbed or confused.

NEW TOOL
OR
– CHANGE IN DESIGN NOTICE –
ON NON DURABLE TOOLS

DATE April 29, 1943

NAME OF PART Impeller
PROD. DWG. NO. 3764320
OPERATION Rough Mach.

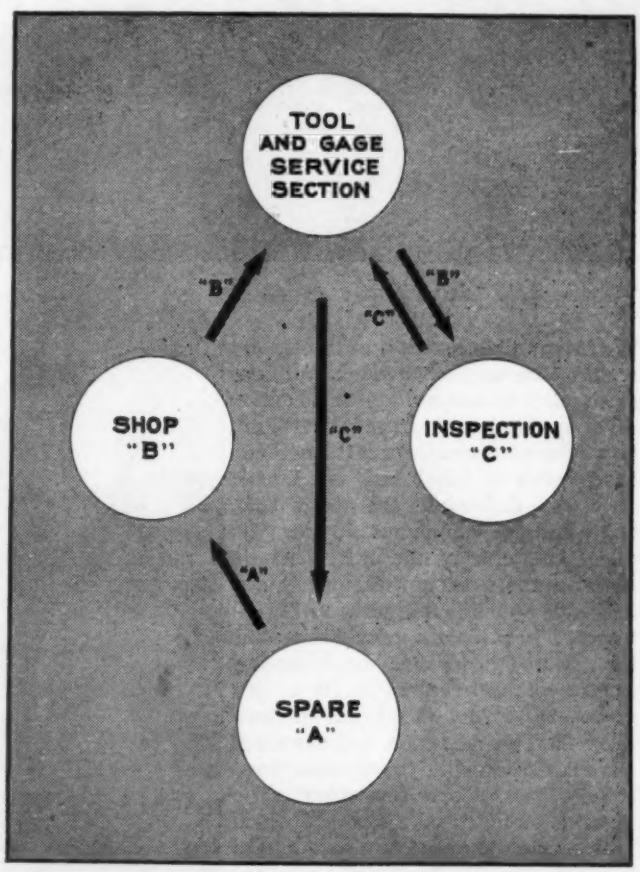
NAME OF TOOL Bar and Pin Gauge
OBSOLETE TOOL DWG. NO. 1072558-2 Pt. 31
ACTIVE TOOL DWG. NO. 1072558-2 Pt. 6

TOOL DWG. CHG. NO.
CHANGES: Scrap all Pt-31 Gauges or salvage parts worth saving-remove all drg. numbers from salvaged parts.

REASONS: New Mfg. Method (Cam Lathe)

MIN. & ORD. BASIS WHEN REQUIRED MIN. ORD.
DISPOSITION OF OLD TOOLS See above
☐ REGRIND ALL TOOLS IN USE, IN STOCK, AND IN MANUFACTURE
☐ OLD TOOLS CANNOT BE USED - REMOVE FROM USE
☐ USE UP OLD TOOLS BEFORE USING NEW ONES
PLANNING MAN ISSUING CV Marsh
TOOL MAN EV Nelson
FOREMAN Ashby-Wilcox-Benson-Woods
TOOL CRIB W Waugh
GRINDING ROOM AJ Sims

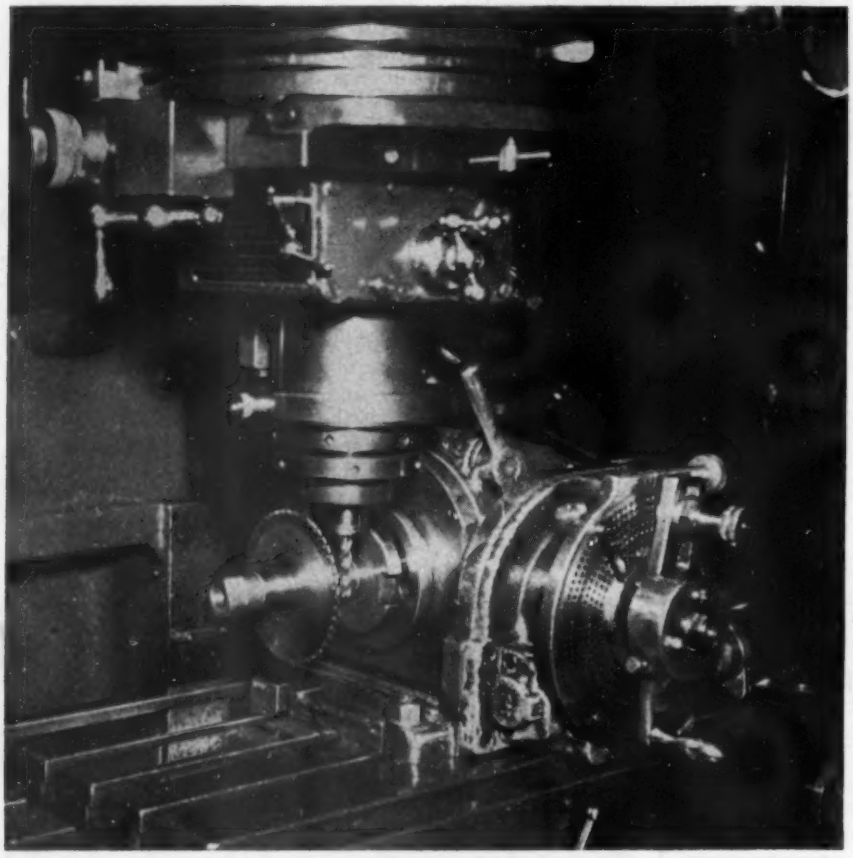
Any product design change that affects gages is recorded on a "Change in Design Notice," copies of which are used as guides in changing all gage records



Flow chart of three identical gages through gage control shows how each gage must pass through the service section before it goes into use or storage

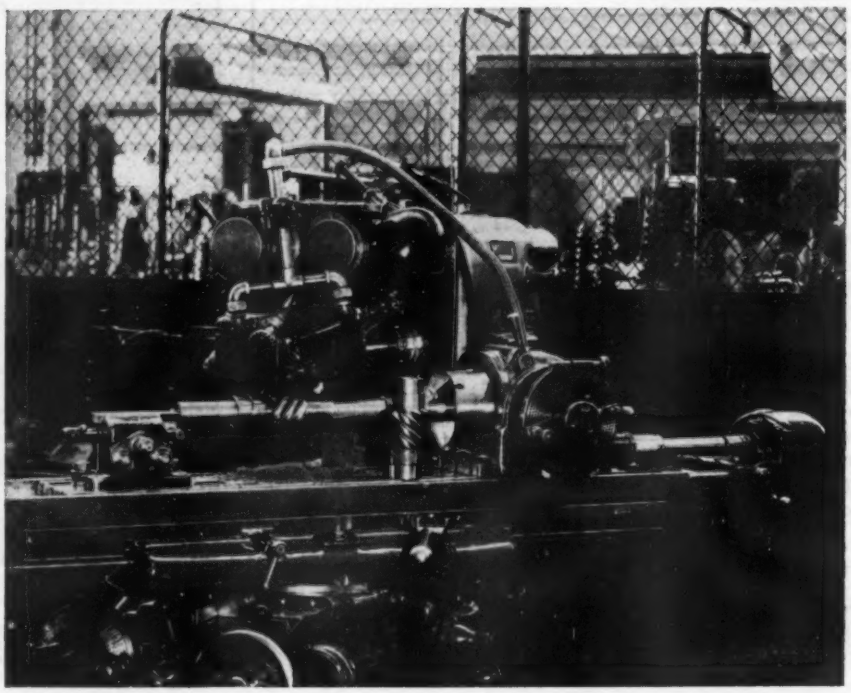
Toolroom Milling — VI

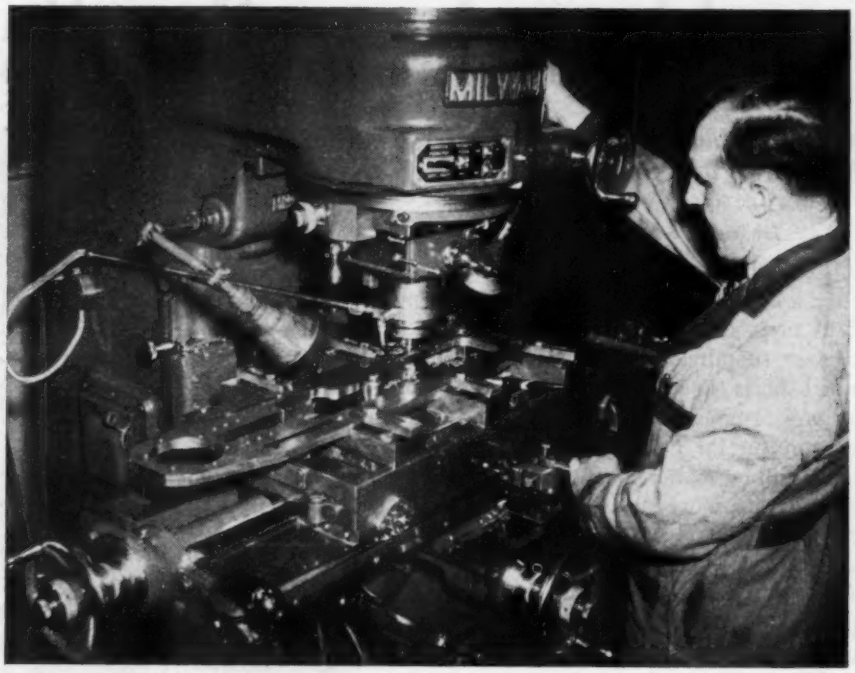
BY H. A. FROMMELT, KEARNEY & TRECKER CORPORATION



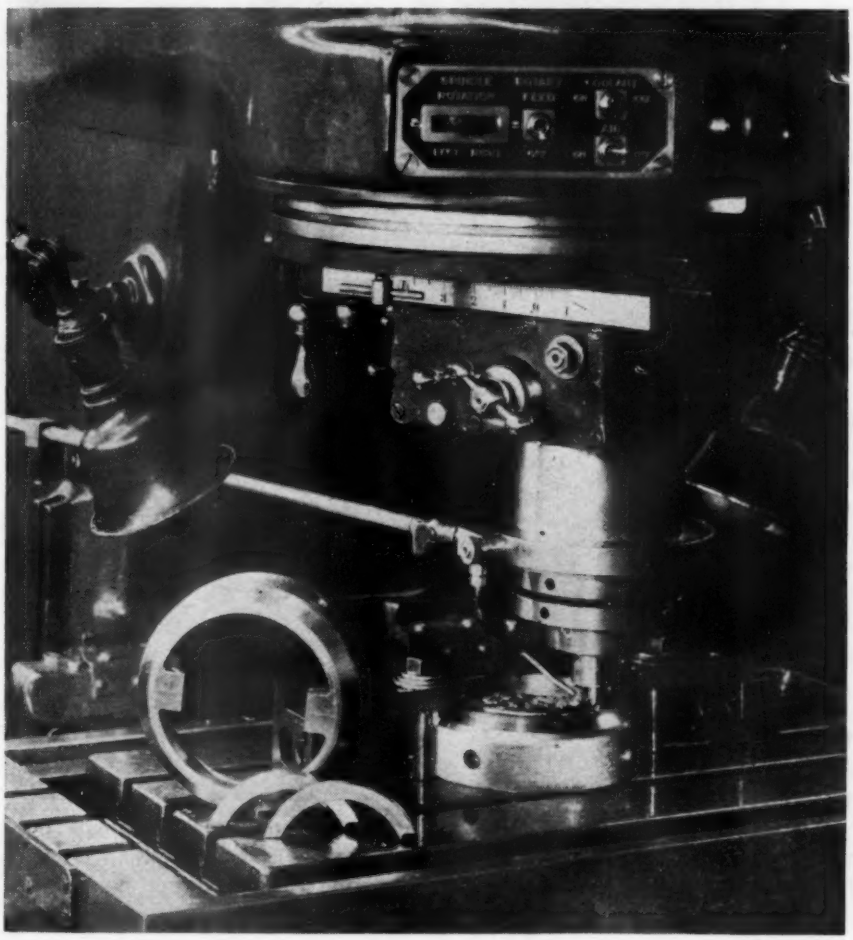
Circular cutters can be milled economically on the rotary head milling machine in less than one-third the time required for standard procedure. Such economy is possible because of the adaptability of the rotary head to the fast and accurate milling of geometrical shapes and outlines. In this machine, the rotary head and spindle are separately driven; however, the center of the spindle can be offset from the center of the rotary head, thus describing a circle or arc thereof. In the circular cutter shown in the illustrated set-up, the teeth form the arc of a circle. The center of the rotary head is set over the center of this arc, using the graduated table and head movements without benefit of layout or indicator. The spindle is offset from this center an amount equal to the radius of the arc plus the radius of the cutter. Trip dogs limit the movement of the rotary head to the specified arc or degree. Likewise, the other operations on this cutter, including the milling of tooth form and relief, are performed by the use of the rotary head principle.

Worms milled as shown in this set-up require the use of universal milling machine, a thread milling attachment, dividing head and conventional lead box. The ten-thread worm shown here has a pitch of 0.8835 in. and a lead of 8.835 in., while the mean lead angle, or helix angle, is 40 deg. 20 min. The table of the universal miller is set, therefore, at this angle. Since lead is 8.835 in., the gears to be interposed between the table screw and the dividing head have the following number of teeth: A = 20, B = 38, C = 28, D = 40, F = 24 and G = 8. This gear train will move the table 8.835 in. while the dividing head spindle makes one revolution. The worm is mounted on a mandrel which in turn is set between the dividing head and tailstock. The form cutter used for the milling of the worm is 4 in. diameter, revolves at 50 r.p.m., and the feed rate is 2.5 in. per min.





Slide plates with intricate contours are milled readily on the rotary head milling machine. For example, the illustrated set-up shows two plates set-up for contouring the center portion, machining of the slots, and locating and drilling holes and circles in the plates to tolerances of plus or minus 0.001 in. The plate is set in locating blocks and clamped, and the table is moved until a 7/16-in. end mill, in this case, is positioned over the contour line. The end mill is sunk through the two plates, and one straight edge of the contour is cut using the longitudinal table feed until the first radius is encountered. The center of the rotary head is then set over the center of the arc forming the corner of the slot, and the spindle is offset an amount equal to the radius of the arc less the radius of the end mill. The rotary head feed is then engaged for exactly 90 deg., the spindle returned to the center of the rotary head, and the proper table feed is engaged until the next radius is encountered. The procedure is repeated until all radii and tangents are milled. No layout is necessary when using this method, since all movements of the table, cross-slide and head are made by means of graduates scales, dials and micrometer rods. The customary method of machining these plates involves a vertical milling machine and jig borer. Since the plates can be contoured, drilled and slotted with one setting and in one operation on the rotary head milling machine, there is approximately a saving of 50 percent in machine time.



Clamp collars, from which segments have to be milled as shown in the illustration, can be set up for this operation on a rotary head milling machine. The center of the rotary head is first aligned with the center of the collar. The spindle, set in a cross-slide, is then offset an amount equal to the radius to be cut less the radius of the end mill. The cutter is then in a position to mill the inside circle of the collar. The rotary head movements are controlled by trip dogs to form the projections, which are ½ in. from the center line. The ⅛ in. radius at the junction of the projections and the ring is formed by the ¼ in. end mill used for milling the collar radius. The straight line forming the projections are milled by means of the cross-slide and table movements. There is a 1/16 in. radius at the corners on the front of the projections; this is formed by setting the center of the rotary head over the center of this radius and offsetting the head 1/16 in. plus the radius of the end mill. The time required for this entire milling operation is 15 min., compared to 1 hr. 24 min. when the job was done on a vertical milling machine equipped with a rotary table.

Ideas From Practical Men

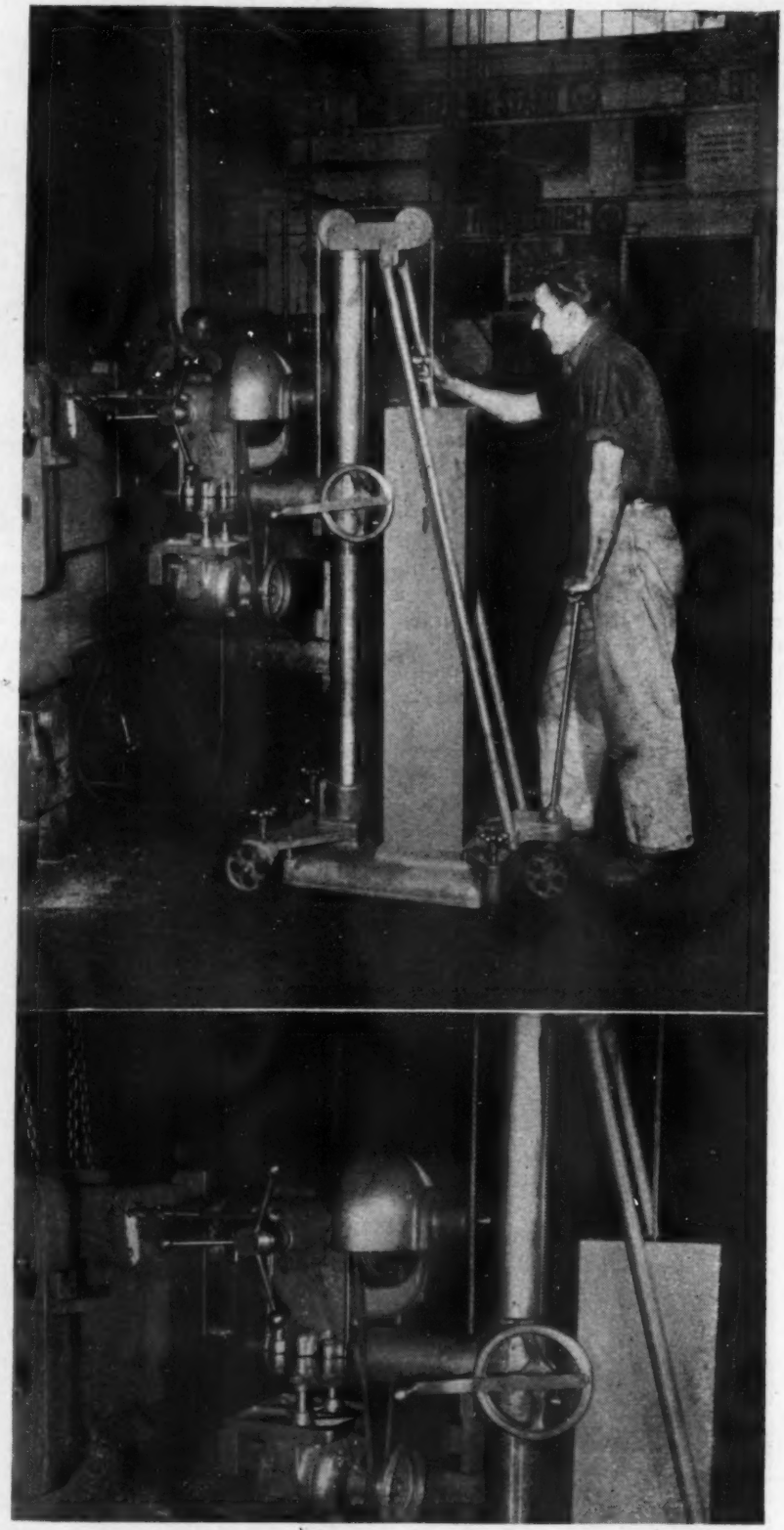
Horizontal Machine Made From Drill Press

BY JOHN BROUWER, Shop Superintendent
Gallmeyer & Livingston Company

A small horizontal drilling machine made from a standard Buffalo No. 18 column-type drill press has paid for itself many times over by simplifying the problem of drilling small holes in the bottom and sides of column castings for large Gallmeyer & Livingston surface grinders. Before this portable drilling machine was developed, it was necessary to move these large castings to a radial drill press or horizontal boring and drilling machine. This made the drilling of some of these small holes an expensive proposition, since in many cases special setups were necessary for the drilling of only one or two holes. Now, these holes can be drilled easily while the column is set up on blocks on the shop floor for the regular way-scraping operations.

Construction of this horizontal drilling machine is shown in the accompanying illustrations. The motor-driven spindle unit was removed from the vertical column and mounted on a horizontal arm extending from a special casting made to fit the round column of the machine. The entire spindle unit, with its driving motor, can be rotated about the horizontal arm, and this arm can be raised or lowered on the vertical column by means of a handwheel on the pinion shaft. This pinion drives in the rack on one side of the vertical column, the rack originally on the column having been extended to the top of the column. A clamp on this arm holds it in any desired vertical position. The drill head unit is supported by a counterweight to permit easy adjustment of the unit for height.

In order to make this machine portable, the base of the drill press was reversed and it was fitted with cast brackets carrying small truck wheels, as shown. These brackets also carry four screws with cup ends which bite into the wood-block floor and prevents movement of the machine during the drilling operation. When it is desired to move the machine, these four screws are turned to raise the cup ends to clear the floor. The drilling head is equipped with a ½ h.p., 1725 r.p.m. Master motor, which has sufficient power to drive drills up to 1⅜ in. diameter in the alloy cast-iron column castings. Usually, the holes drilled with this machine are under 1-in. diameter.



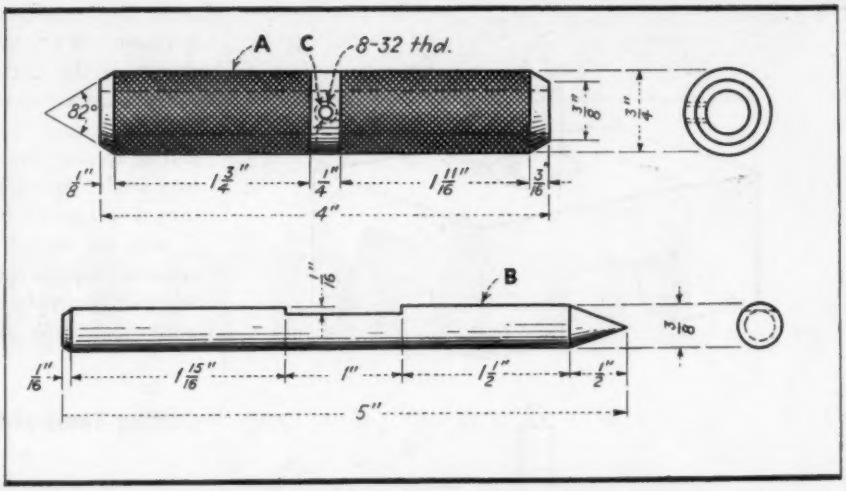
This horizontal drilling unit was made by removing the spindle and motor-drive assembly from a column-type drill and mounting it on a horizontal arm. The entire head can be rotated about the axis of the horizontal arm

Locates Center Punch In Countersunk Holes

BY C. F. FITZ

We have a large plate department in our plant and were having considerable difficulty with center punching mating plates, when the top plate through which the punch had to be inserted was drilled and countersunk. We overcame this by designing the center punch shown in the drawing.

Body *A* of the punch is made from tool steel, properly heat-treated and ground to the dimensions shown. Punch *B* is inserted in the 3/8 in. hole in body *A* and is lapped to a sliding fit. When used, the punch is inserted in body *A* which is lowered into the countersunk hole, and then the punch is tightened with setscrew *C*. Thus the punch is centered from the countersink, and a hammer blow locates the center of the hole to be drilled in the mating plate. The results obtained with this tool have been very accurate.



This center punch is used to locate hole centers in mating plates when the top plate has been drilled and countersunk

Roller Tool Reclaims Rejected Motor Frames

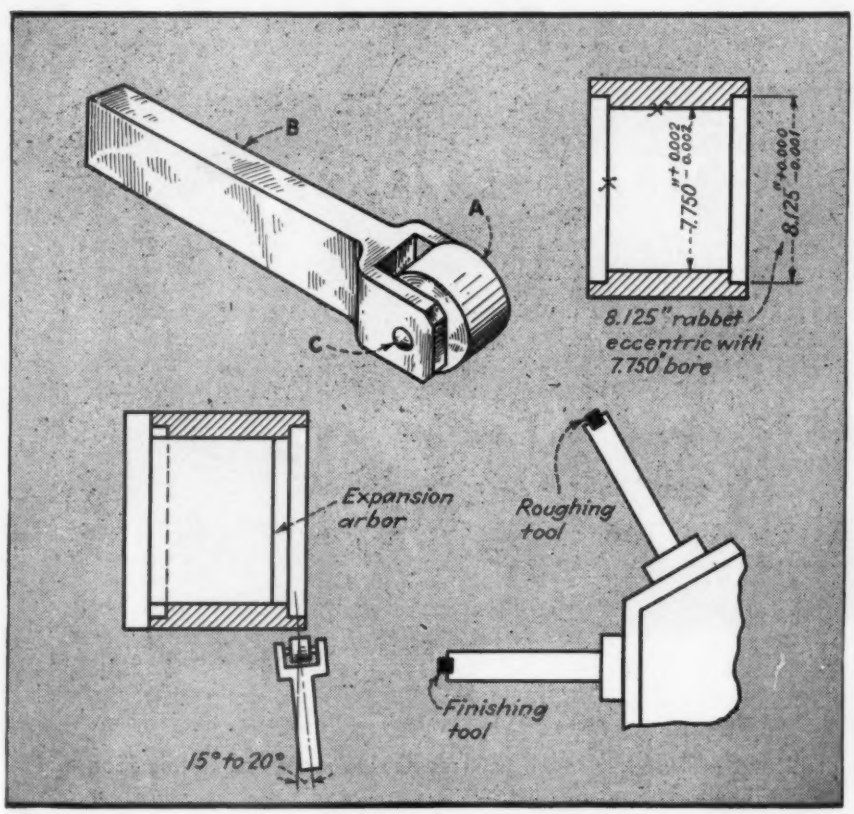
BY E. J. BREEDING

One of our recent repair jobs was a large order of steel motor frames *A* that had been rejected because the field bore was eccentric with the female rabbet in each end. The bore and rabbets, in this instance, were the only close tolerance dimensions. Tool *B*, the roller of which revolves freely on its shaft, was used to bring the bore and rabbets concentric for re-machining.

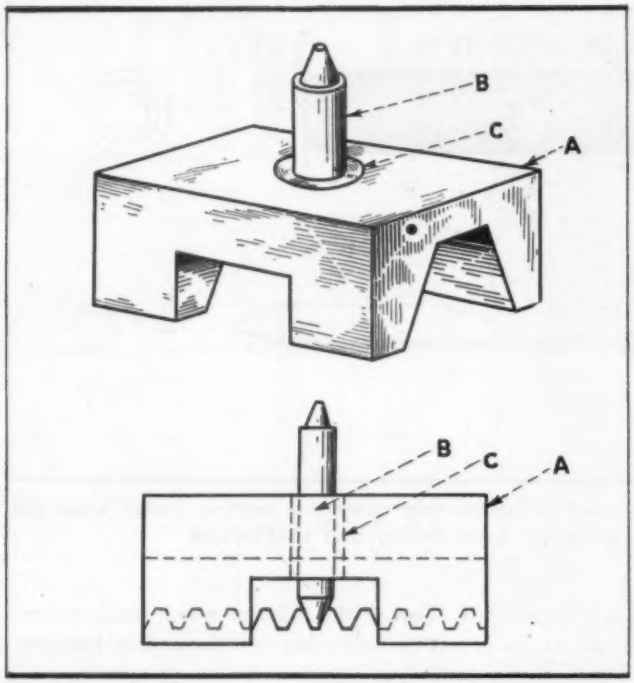
Frame *A* was placed on an expansion arbor to locate the work from the bore and bring each rabbet concentric with the bore. Roller tool *B* was set at an angle of 15 to 20 deg. in the cross-slide turret and fed by hand against the corner of frame *A*, which was rotated at a slow spindle speed. After the rabbet was rolled inward, rough and finish cuts were taken with tools on the main turret to bring the rabbets back to the required 8.125 in. dimension. The frame was then faced to proper length with a tool on the cross-slide turret.

This procedure pressed the metal in uniformly along the entire circumference until the rabbet was several thousandths of an inch undersize. Re-machining restored the rabbet size and brought it true with the bore. The depression at each end of the frame on the outside diameter caused by the roller was of little consequence, since the outside diameter was not held to close tolerance.

As this job is being run at present, an oversize or eccentric rabbet is discovered before the frame is removed from machine during the original machining operations. The rabbet is then rolled before the finishing cut is taken on the outside diameter, thus removing the roller marks. However, the tool is still used to repair the occasional frame that does not pass inspection. The tool has also been used for other purposes, such as rolling and re-cutting soft-faced adaptors to desired size.



Recessed shoulders eccentric with the bore of motor frames are rolled with this tool and re-machined to bring them concentric



This gage block rests over threads so that a vertical gage pin can be used to check the included thread angle

Pin Gage Checks Thread Angles

BY HAROLD W. SUNDSTROM

Checking angles of threads on the optical comparator is the standard method of insuring basic and uniform three-wire measurement of threads. Since the exactness of this operation is essential to a correct basic three-wire measurement, it is necessary that a quick method be available to the operator. With no optical comparator available, the gage shown in the drawing was designed and has proved entirely satisfactory.

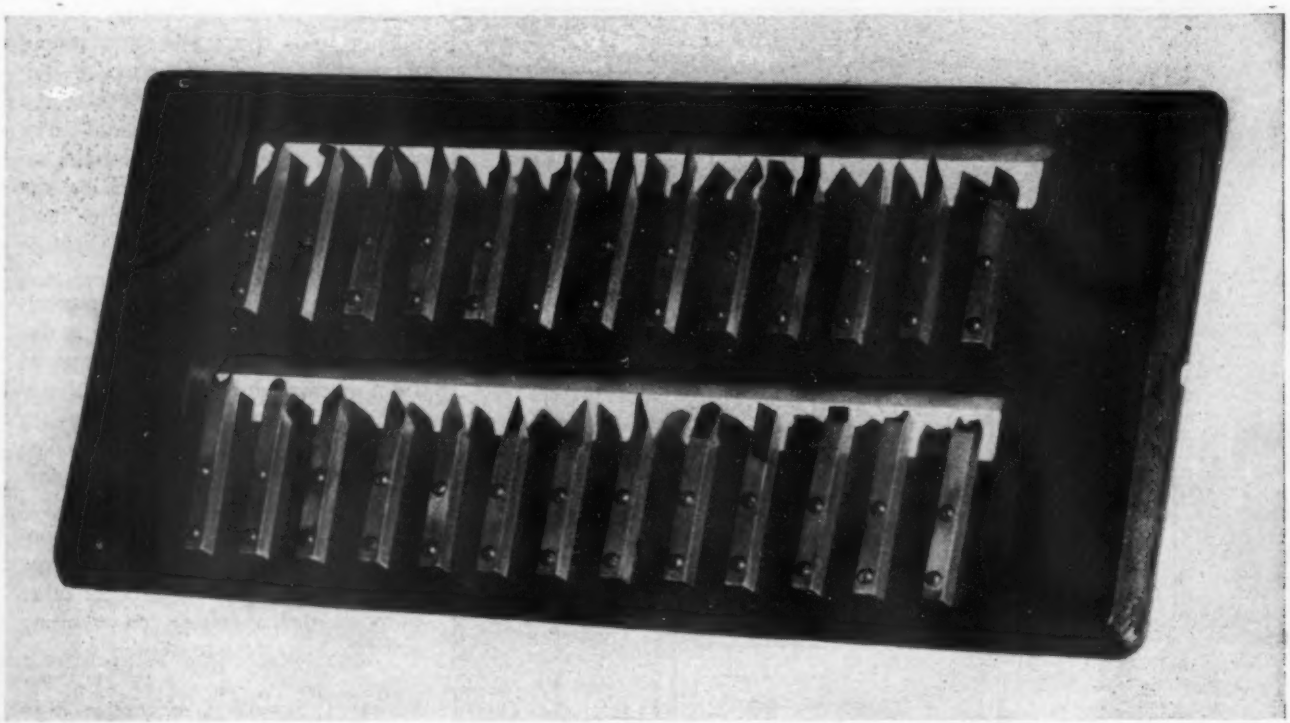
V-block gage *A* is placed on the work to be checked, insuring accurate control and a right-angle check at the pressure angle. Spindle *B*, the ends of which are ground to the thread angles to be checked, is inserted through bushing *C* into the thread. The operator then sights through the cut away section on the side of block *A* and can see at once whether the included angle of the thread is correct and, if not, which flank of the thread is off.

Cutting Tools of Carbon Steel Help Trainees

BY CHARLES HATTENBERGER

Machine operators in our plant are required to grind their own cutting tools. It was a difficult problem to teach trainees how to recognize the great variety of tools which they would have to handle and grind, even though perspective drawings were available to show them the shape of the tools and the required angles thereon. Only occasionally could actual cutting tools be released for classroom work.

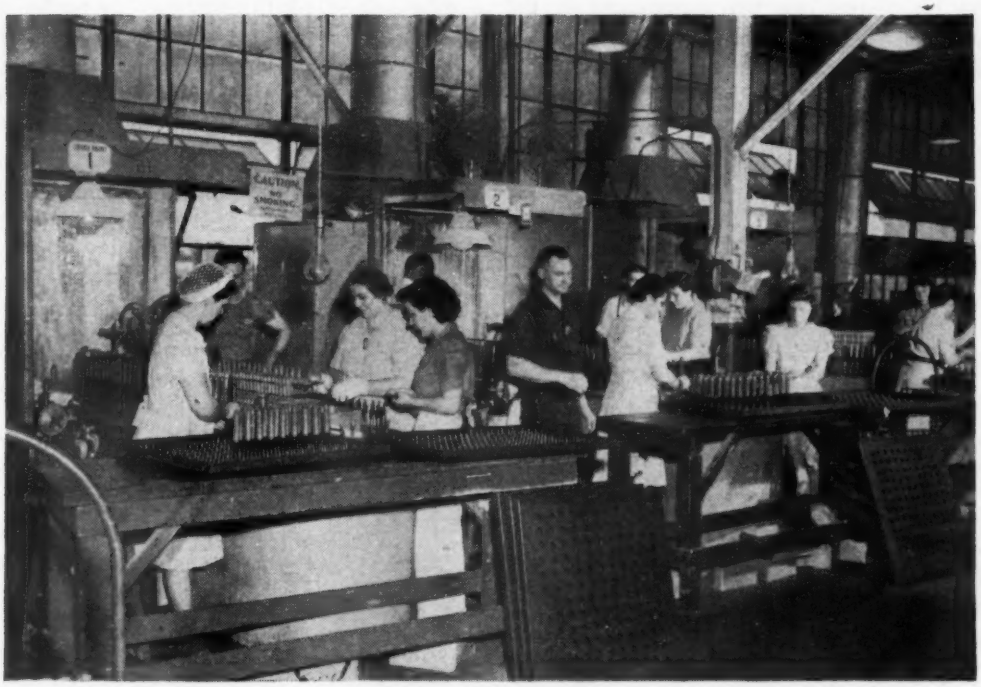
In order to have a complete set of tools for study by trainees, and yet not cut into the supply of high-speed steel and tungsten-carbide cutting tools, we made up a complete set of tools from plain carbon steel. These were mounted on a wooden panel with slots behind the cutting points so that a full view of the angles on the tools can be had at a glance. These tools, used in conjunction with the drawings previously employed, have proved very successful and have cut training time on this subject to a minimum.



These tools are made of plain carbon steel and are used to teach trainees how to recognize cutting tools and the angles ground thereon

Armament

SECTION OF AMERICAN MACHINIST



Automatic DeVilbiss spraying machines are located in a battery of waterwash spray booths. One gun sprays the inside of the case; two spray the outside. Work is loaded on spindles with a tip that fits the primer hole, and this method of work support makes it easy to transfer the sprayed pieces to trays for baking in a batch-type oven

Manufacture of 20-mm. Steel Cartridge Cases

By MAJOR R. G. VAN NESS, Chief, Review and Information Unit
Technical Information Section, Office of the Chief of Ordnance

Manufacture of 20-mm. Steel Cartridge Cases

U. S. ARMY ORDNANCE let the first contracts for 20-mm. M 21 Hispano-Suiza rounds in the summer of 1941. Of the participating firms, Dura Division, Detroit Harvester Company, at Toledo, was the first to establish a satisfactory manufacturing procedure, and subsequently became the second largest producer of the 20-mm. brass case. Process development work for a steel case was commenced by the Toledo concern well in advance of January, 1943, when the last brass case was run because of the metal-supply situation. Dura reached peak volume on the steel case in May of this year, was again the first to develop satisfactory manufacturing methods, and is now the largest producer of the steel case for Ordnance.

This success record stems from the company's ability and the help that it has received generously from many sources. When Army Ordnance placed the first contracts for the brass 20-mm. case, the Bridgeport Brass Company was the only American manufacturer with any experience—having been in production for some months for the British Purchasing Commission. Dura began production with makeshift equipment, then set up a plant largely tooled according to methods already proved at Bridgeport Brass. All drawing presses were operated at 40 strokes per min. Those for cupping and the first draw had a 12 in. stroke; machines for the second, third and fourth draws were ordered with a 17-in. stroke. Other equipment was balanced accordingly for a theoretical capacity of 2,500,000 pieces per month.

No coolant is used in cupping, but the blanks have been pre-coated with Gilron soap and dried. With two sets of tools, the production is two per stroke, 32 strokes per min.

With the change to the steel case, an additional line of equipment was purchased, being planned to permit consolidation with converted brass equipment. The following material discusses the problems encountered in converting to, and manufacture of, the 20-mm. steel cartridge case.

Material is purchased in the form of pickled and oiled blanks, with the steel manufacturer paying special attention to providing uniform bevel around the periphery. Tolerances are: thickness, 0.020 in., diameter, 0.010 in., with hardness not to exceed Rockwell 65 on the 30-T scale. Some roughening of the surface is desirable to promote adherence of lubricant in the cupping operation.

In accordance with recommendations of the Cartridge Case Industry Committee, first manufacture of the steel case was attempted with a drawn cup similar to that used for brass. Serious difficulties were encountered in forming the head from a semi-spherical shape. There was a tendency toward cold shuts and folds, and grain structure was so disturbed that in firing there was constant

danger of the head blowing out on a line at approximately 45 deg. from the extractor groove.

It was proposed by Bowen Products Corporation, Ecorse, Mich., and independently by Metal Specialty Corporation, Cincinnati, that the cup form be changed to an exaggerated saucer shape, cold coined from the conventional disk, and with the head of such shape and diameter as to require no additional cold working except for a slight draw on the outside diameter to increase wall hardness near the head. This suggestion proved successful with certain changes. It was found advisable to dress the disk to decrease possibility of cracks along the mouth of the cup, to maintain uniformity of wall in coining, and to prevent skidding in the die. For this dressing up, the practice of the Dura Company is to swage the disk from both sides, producing a smooth outside diameter to accurate dimensions and with a slight bevel on one side to assist in entering the coining die.

On the coining punch there is a point which first contacts the disk to prevent sliding as it is pressed into the die. The countersink so produced partially remains after the fifth draw, giving space into which metal can flow during the indenting operation. The cup was also altered by Dura to a slightly crowned bottom in order to counteract the tendency of the case head to become concave in the drawing operations.

The next difficulty encountered in producing a case meeting ballistic requirements was the tendency toward head expansion, resulting in loose or blown primers. The primer on this caliber case is merely pressed into the primer pocket and held loosely by a staking operation. Some quarters stated that if cold working were to be attempted around the primer pocket, metal flow would be disturbed as with the drawn cup. It was believed necessary completely to machine the primer pocket.

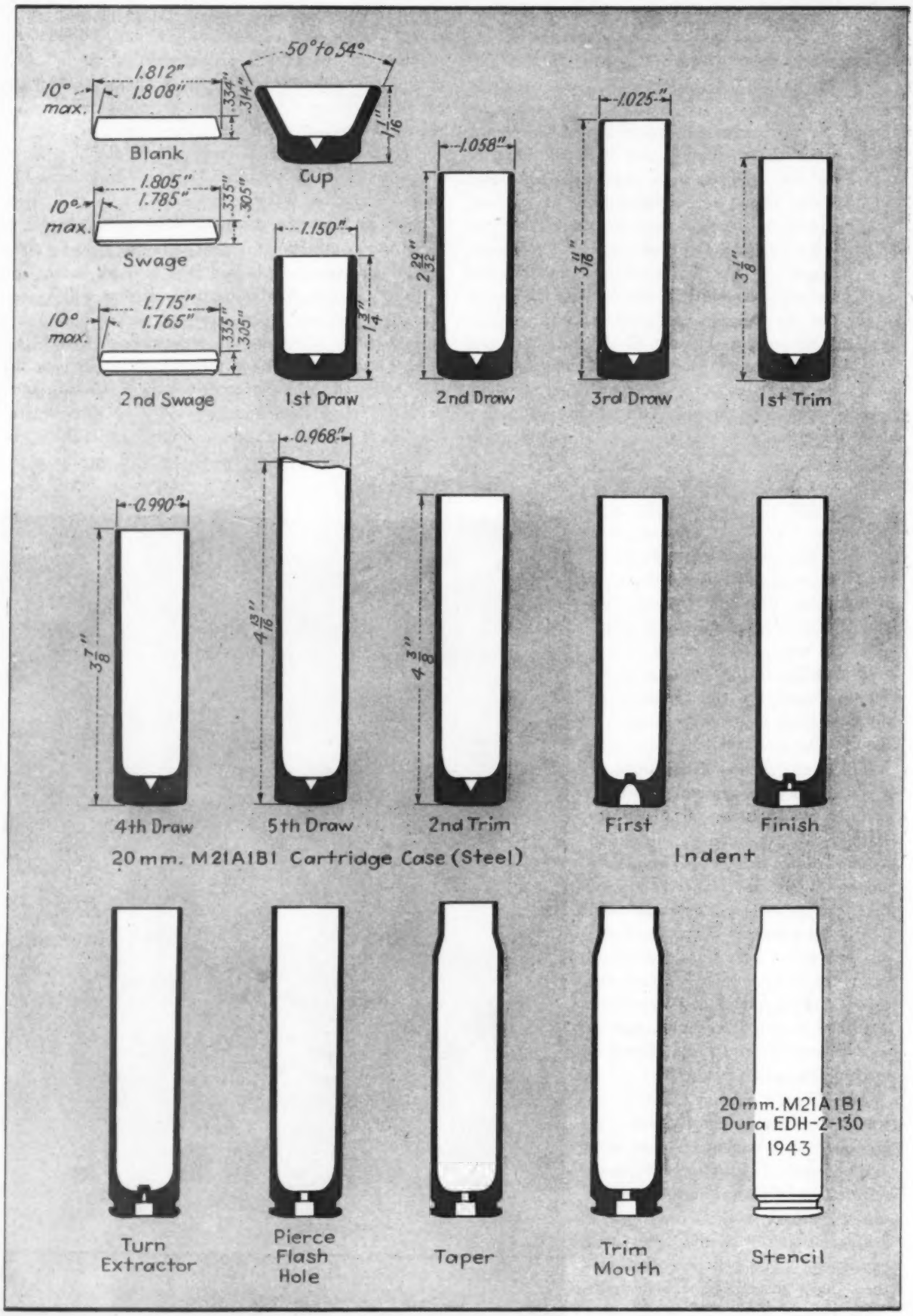
The Dura Company's first move was a combination of the two operations. A breakdown indent with a round-end, slightly tapered punch resulted in cold working around the finished primer pocket, producing a degree of hardness that prevented expansion. The primer pocket was then finish machined on six-spindle New Britain Gridley chucking machines. No trouble was encountered in firing after this procedure, but there were certain objections to using this practice.

On a high production basis, the close tolerances required in the primer pocket entailed a difficult machining operation with a high amount of scrap even though some salvage was possible. Difficulty was also experienced in preventing spiral grooves in the pocket wall, arising from pickup of chips during withdrawal of the final reamer. Experience of other contractors was the same.

Various alternate methods were developed such as an initial breakdown indent followed by the piercing of an oversize hole and then a finish indent in a third press to final dimension, during which the metal pierced out of the primer pocket flowed in and partially filled up the previously pierced hole. The fourth operation of piercing the flash hole to size followed. This practice proved successful, but with Dura's equipment it was essential to complete the operation in one press without removal.

Further development work resulted in the pro-

Tube discharge is used from the second-draw press to the third-draw press, and similarly between the fourth and fifth draws, because annealing is not required between these operations



More operations are required to produce the steel 20-mm. cartridge case than the original brass counterpart. Chief differences in press work lie in the methods of cupping and indenting and the number of draws

OPERATION SHEET

1. Spot inspect steel blanks for:
   (a) Thickness, diameter and shearing bevel.
   (b) Rockwell hardness, surface characteristics, evidence of lamination or other defect.
2. Wash, apply Gilron coating and dry. Spiral drum-type Niagara washing machine which was previously used on brass production for pickle after anneals.
3. Swage one side in No. 6½ Toledo OBI press with stack feed, mechanical knockout and air ejection. Production one at a stroke, approximately 75 strokes per min.
4. Wash, apply Gilron and dry in same washer as Operation No. 2.
5. Swage second side and bevel in same size press and with feed as used on Operation No. 3.
6. Wash, apply Gilron and dry in same washer as Operations No. 2 and No. 4.
7. Coin cup in 400-ton Clearing 6-in. stroke knuckle-joint press equipped with stack feed, mechanical knockout and ejection. Press fitted with two water-jacketed dies and air-cooled punch, no coolant used. Production two per stroke at 32 strokes per min.
8. Spot inspection on indicator gage fixture for wall thickness, concentricity, head thickness. Also visual inspection for scratches, galling, mouth cracks.
9. Wash and dry in spiral-drum Niagara washer discharging directly into Inconel annealing baskets.
10. Anneal at 1320 F. in roller-hearth, gas-fired, atmospheric-controlled Surface Combustion furnace. Approximately 40 min. in furnace, 65 min. in cooling chamber.
11. Etch in seven percent sulphuric acid at 175 F. for 4 min., neutralize, rinse, apply Gilron coating and dry. Continuous operation in spiral-drum Niagara machine.
12. First draw in Clearing 100-ton, 12-in. stroke eccentric press with dial feed. Production two per stroke at 32 strokes per min.
13. Spot inspection on indicator gage fixture for wall thickness and head thickness. Visual inspection for scratches, galling or cracks.
14. Wash and dry in same machine as Operation No. 9.
15. Anneal at 1320 F. same as Operation No. 10.
16. Etch, wash and apply Gilron same as Operation No. 11.
17. Second draw in Clearing 14-in. stroke eccentric press with chain feed. Production two per stroke at 32 strokes per min. Discharge through tubes directly to hopper at 3rd draw.
18. Spot inspection on indicator gage fixture for wall thickness and head. Also visual inspection for scratches, galling, and cracks.
19. Third draw on Clearing 100-ton eccentric press with dial feed. Production and strokes per minute same as preceding draws.
20. Spot inspection.
21. Wash and dry in spiral-drum, two-stage Niagara washer.
22. Trim to length on Oakes special automatic chute-feed, cutoff machines. Production rate, 35 pieces per min. per machine.
23. Wash and dry in same unit as Operations No. 9 and No. 14.
24. Anneal at 1320 F. the same as Operations No. 10 and No. 15.
25. Etch, wash and apply Gilron same as Operations No. 11 and No. 16.
26. Fourth draw on 100-ton Clearing eccentric presses, producing two at a stroke at 32 strokes per min. One press has a 17-in. stroke dial feed previously used on brass production, the other a 14-in. stroke chain feed. Automatic discharge through tubes to hopper at fifth draw.
27. Spot inspection as on other draws.
28. Fifth draw on 100-ton Clearing eccentric presses at same rate and same strokes as fourth draw. Discharge through tubes to next operation.
29. Spot inspection as on previous draws.
30. Trim to length on special V & O rotary cutter trimming machines which were previously used for brass. Production 40 per min. per machine.
31. Gage for length and remove any trimmings mixed with cases.
32. Wash and dry in same washer as Operation No. 21.
33. Visual inspection for slugs inside cases, bent mouth and imperfect trim.
34. Head and indent, a two-stage operation on 200-ton Clearing knuckle joint presses. Production one per stroke at 36 strokes per min., with mechanical knockout and automatic pickoff.
35. Spot inspection for primer-pocket diameter and depth. Also visual inspection for chipped pegs.
36. Wash and dry in same unit as Operations No. 21 and No. 32.
37. Stress relieve at 725 F., with a one-hour soak after reaching temperature.
38. Turn extractor groove on six-spindle New Britain-Gridley chucking machine with chute loading. Production rate 800 per hour gross.
39. Spot check at each machine with go and not go gages for flange diameter and width, and groove diameter.
40. Wash and dry in spiral-drum Niagara washer.
41. Pierce flash hole on Rockwood horning press, hand feed over post.
42. Taper and neck on No. 165 special Bliss horizontal press which operates at 43 strokes per min.
43. Spot check taper with chamber gage and mouth diameter with go and not go plug gage.
44. Wash and dry in same unit as Operation No. 40.
45. Trim mouth on special No. 80 Bliss trimming machine. Production 22 pieces per min.
46. Mouth anneal on Morrison conveyor-type flame annealing machine.
47. Constant spot check of mouth hardness with Wilson Rockwell 30-T machine, also hourly check of hardness at all other points.
48. Raw inspection—visual and dimensional.
49. Government acceptance on "quality control" basis.
50. Bonderize in Udylite "umbrella" machine, fully automatic.
51. Ink stencil manufacture, caliber, date and lot number on wall, using Markem machine.
52. Spray lacquer inside and out. DeVilbiss automatic spray with waterwash booth. Capacity each unit, 45 per min.
53. Bake in R. C. Mahon gas-fired batch oven.
54. Cool and spray primer pocket with air-dry lacquer, using hand spray gun.
55. Visual inspection for lacquer defects.
56. Government final acceptance.
57. Pack in cartons.

cedure shown on the operating diagram. This consists of a breakdown indent with a 60-deg. round-end pointed punch, the work being carried over a peg with a ⅛-in. hole through its center. This operation is performed in one station of a 200-ton knuckle-joint press, the post being carried on a dial with ratchet feed. There are eight posts to the dial. After the breakdown indent, the dial is moved to the next station which is equipped with a feeler attached to a micro-switch so that the press will shut down if the breakdown-indent peg has broken and has remained in the head of the case. In the following station the primer pocket is formed to final size, including the radius around the mouth, the flash hole being pierced after turning the extractor groove. The head of the case is not further machined, the only machining operation being on the extractor groove itself.

This procedure has proved successful both from the standpoint of production and also in firing. The press operation is fast, production from each press being 35 pieces per min. one at a time. Downtime is not excessive, although great care must be taken with respect to material, heat-treatment and finish of the indenting pegs, and the press must be kept tight.

Early in the development procedure, trouble was encountered with cracking, and in a few cases actual shearing of the extractor flange in firing. At one time it was recommended that the flange be annealed either by flame or induction heat, but this remedy did not appear practical. It was found that if the case was heated above the critical point; that is, around 1600 to 1650 F. in the final annealing operation, cracking of the extractor flange disappeared. However, the high-temperature anneal increased the trouble of drawing on the fourth and fifth draws, and also made the indenting and machining operations more difficult. After considerable experimentation it was discovered that fractured flanges, which occurred only when rounds were fired after freezing to —40 F., could be prevented by greater attention to stress relief. When the soak time was increased from half an hour to a full hour with temperature at approximately 725 F., no further trouble was experienced and this procedure has since been followed.

In addition to these problems which had not been previously encountered in the manufacture of the brass case, it was necessary to determine the maximum possible drawing speed and to obtain reasonable punch and die life by some means of lubrication. With a reduction in drawing speed of approximately 25 percent; that is, 32 instead of 40 strokes per min., die wear and galling were not excessive. No alterations were made in presses except to replace the 1200 r.p.m. driving motor with a 900 r.p.m. motor of somewhat greater horsepower to compensate for

DETAILS OF WASHING, ANNEALING, ETCHING AND LUBRICATION

Disks

Niagara 4-stage spiral-drum washer:

1. Clean in 10 oz. per gal. Northwest No. 62 or Clipo No. 26E at 180 F.
2. Rinse in warm water
3. Gilron No. 1033, 14 oz. per gal. at 190-200 F.
4. Dry over gas flame

Cupping

Run without lubrication, water-jacketed die and air-blast cooled punch

Wash Before Anneal

Niagara 3-stage spiral-drum washer:

1. Clean with Oakite No. 37, 3 oz. per gal., at 180 F.
2. Cold-water rinse
3. Warm-water rinse (Since only a clean anneal is required, parts are not dried thoroughly before loading into furnace)

Anneal

Surface Combustion rotary-hearth, gas-fired, atmospheric-controlled furnace, at 1320 F. for all anneals (after cupping, first draw and third draw) 40 min. in furnace, (20 min. at heat), 65 min. in cooling chamber

30-T Rockwell Inspection:

Cup: 77-80; anneal to 55-60
First Draw: 75-77; anneal to 55-58
Third Draw: 77-79; anneal to 58-61

Etch

Niagara 6-stage continuous spiral-drum washer:

1. Etching solution, five to seven percent sulphuric acid by volume at 170-180 F. Time, 4 min. Two percent by weight of copper sulphate and 1 oz. of Nep powder (Wm. N. Parkin Co., Pittsburgh) per gal. of acid added as inhibitors
2. Rinse in warm water
3. Neutralize for 2 min.—3 oz. per gal. Oakite No. 37 at 180 F.
4. Rinse in hot water at 180 F. This is important to bring parts to temperature for Gilron bath
5. Gilron No. 1033 or Bruce No. 750, 12 oz. per gal. at 190-200 F. Time, 4 min.
6. Dry with hot-air blast

Draws

Oil coolant—Bruko compound 360-C, Shell Garia No. 27-A or Monco drawing oil. Each press has an independent reservoir holding about 60 gal. Artificial cooling is not found necessary but frequent filtering is required. Note: no etch or Gilron preparation between second and third, or between fourth and fifth draws. Parts delivered automatically through tubes from one operation to the next

Wash

After third and fifth draws and after indent:
3-stage spiral drum:

1. 10 oz. per gal. of AP cleaner at 180 F.
2. Rinse in warm water
3. Dry—gas flame

Wash

After machining and taper:
3-stage spiral drum:

1. 10 oz. per gal. of AP cleaner at 180 F.
2. Warm-water rinse
3. Dry

Gilron Check

To a 25 ml sample add four to five drops methyl orange indicator, titrate with normal hydrochloric acid to orange-red end point

Calculations $\frac{\text{C.C.}}{0.88} = \text{oz./gal.}$

loss in flywheel effect. Gilron soap, applied in liquid solution and with the amount of coating carefully controlled, has proved to be a satisfactory drawing lubricant.

The Bliss horizontal tapering press operates on steel at the same speed and with the same tooling as used on brass. It was found, however, that the Bliss No. 80 head turning equipment could not handle the turning of the extractor groove. This machine was therefore stripped of its groove cutting tool and is used only for the final mouth trim.

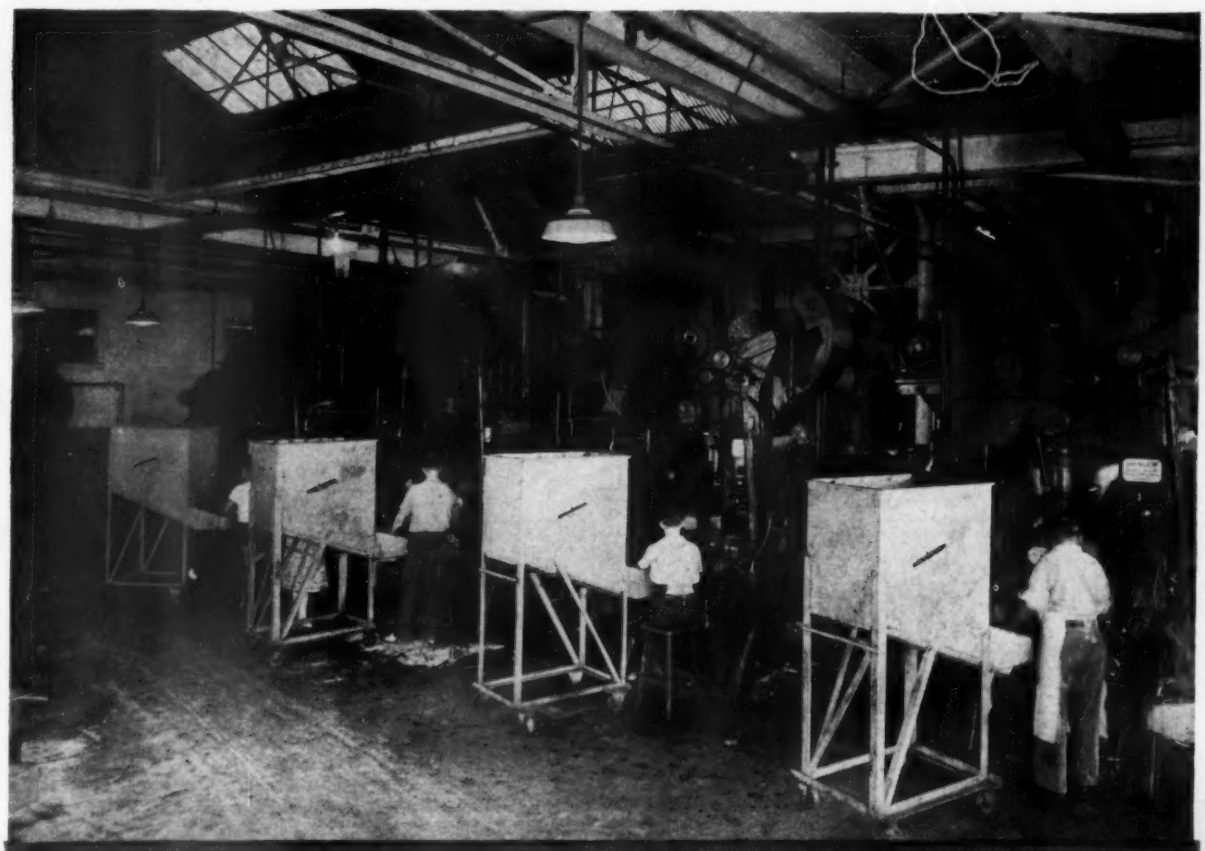
Head turning was the only operation requiring new equipment. Since no special-purpose machine was then available, six-spindle New Britain-Gridley chucking machines were installed. The trimming operation after the third and fifth draws can be performed on V & O special trimmers or on the Oakes automatic machine, but the speed is not as high as on brass.

The only other process problem was annealing, which is done at 1320 F. after cupping and the first and third draws. As production increased it became increasingly difficult to obtain uniform annealing results with modified batch furnaces. Uniformity was possible only by increasing soak time and adding furnaces. Fortunately an atmospheric-control clean anneal furnace of adequate capacity was located and installed. Nevertheless, surface etching was found necessary after annealing in order to provide proper adherence of the lubricating-soap pre-coat.

Cup to Accurate Dimensions

Certain other production kinks have been developed. The original coining operation was carried on with a coolant, but it was found that better results could be obtained if the die is run dry, cooling of the dies being taken care of by water jacketing and a constant blast of air on the punch. Special attention is paid to inspection on this operation as it is absolutely essential for the successful production of a finished case that the cup be accurate to dimension, free from scratches or excessive cracks around the mouth. Slight cracking will cause no difficulty as this metal will be trimmed off after the third draw operation.

Again very careful spot inspection is given after the drawing operation. It has been found better to spend labor in floor inspection at each operation, thereby catching trouble at its point of origin, rather

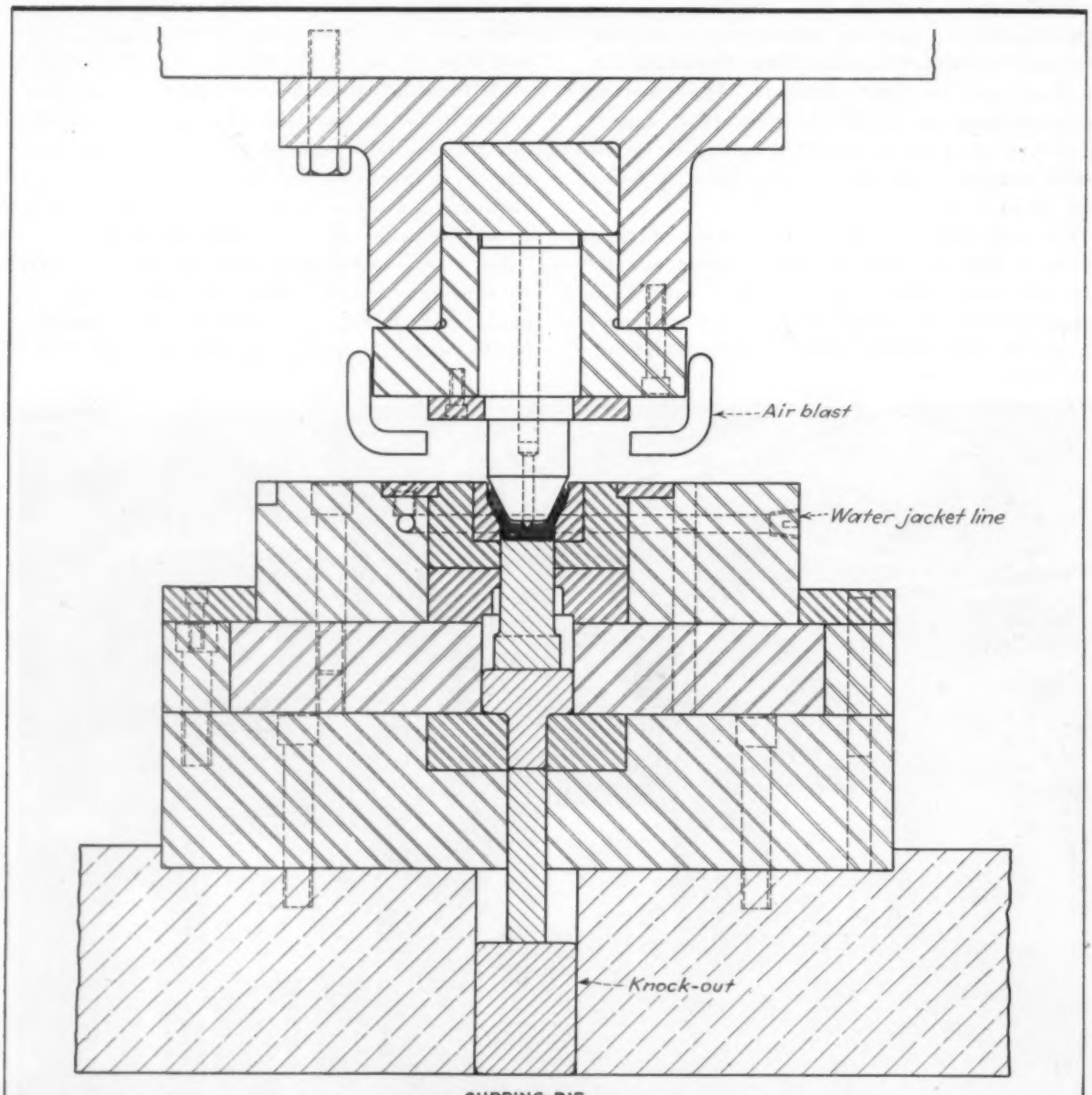


Washed cases are discharged into these hoppers, which are placed on casters for easy movement to the battery of Clearing 200-ton indenting presses

than allow off-dimension or otherwise defective material to flow into the next process.

There is no lubricant pre-coat between the second and third draws. After the third draw, cases are washed because the collets of the Oakes trimming machine clogged when the parts were run through directly from the draw press. Final trim after the fifth draw is done on a V & O rotary-type cutter without an intervening wash. Cases as discharged from the trimming machines are gaged for length, and care is taken to see that no trimmings are mixed with the cases. The small trim rings are likely to be bent in the washing machine and fall inside the case, causing trouble on later operations.

All draw presses originally used on the brass case production were equipped with dial feeds. These feeds were entirely satisfactory but the mechanism required 120 deg. of rotation of the crankshaft to index the dial, thereby materially reducing the useful percentage of stroke. New presses for the steel line were equipped with chain feeds, operated directly from the slide and indexed with a stroke movement of less than 2 in. Thus, a 14 in. stroke press with chain feed is equivalent to an 18 in. stroke press



CUPPING DIE

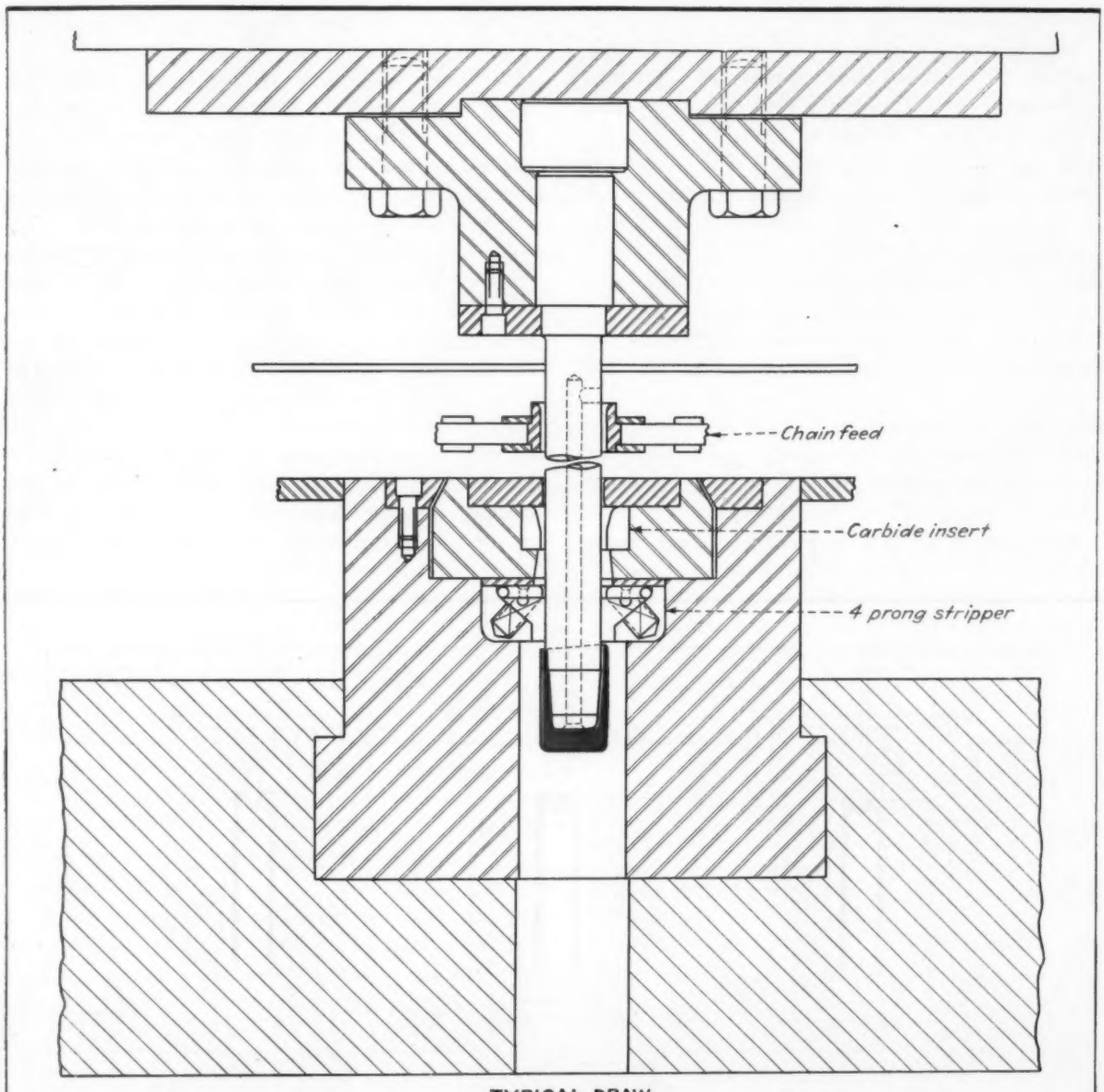
As with larger steel cases, the cup for the 20-mm. size is made in a saucer shape, so that metal in the head is not disturbed in later operations, except for a slight draw at the outer surface to increase the Rockwell hardness of the adjacent wall section

with dial feed, and the press can be run at a correspondingly higher number of strokes per minute without increasing the actual drawing speed. These chain feeds have been satisfactory, although they are somewhat more subject to damage in case of a press wreck than is the case with a dial.

Three stages are required for indenting. A micro-safety switch is provided between the breakdown and final indent to prevent wrecking the third station should a breakdown-indent peg break off and remain in the piece. Draw presses are also equipped with these safety switches to prevent over-long cases getting into operation position and interfere with the punch. In fact, safety switches have been installed wherever possible, and they have proved their value in maintaining continuous operation.

After indenting the cases are washed and dried before being placed in stress relief furnace, to prevent baking oil or drawing compound on the work. Stress relief is done at this point rather than after machining the extractor groove or flange in order to avoid distortion of that section.

Machining the extractor groove is done on six-spindle New Britain-Gridley chucking machines.



TYPICAL DRAW

Draw dies embody carbide draw rings of the type standardized by the Cartridge Case Industry Committee, and these rings have given as many as 900,000 pieces without polishing. When dies wear beyond the upper diameter limit they are reground for the preceding draw

Collets on these machines are of the draw-in type, so that cases cannot be accurately located from the outside of the head. When it was found that a cut across the face of the head was not necessary and further was not possible if the primer pocket is formed to dimension in a press, some means had to be developed to overcome this difficulty. The second station (not needed as an operation station) is fitted with a ball-bearing ram to push the case slightly further into the collet after the latter closes. This works well if the collet fingers are kept smooth and properly adjusted.

Mouth anneal is done on a flame-type Morrison machine. A constant check is made of correctness of the mouth anneal; also a complete hardness check is taken not less than once an hour.

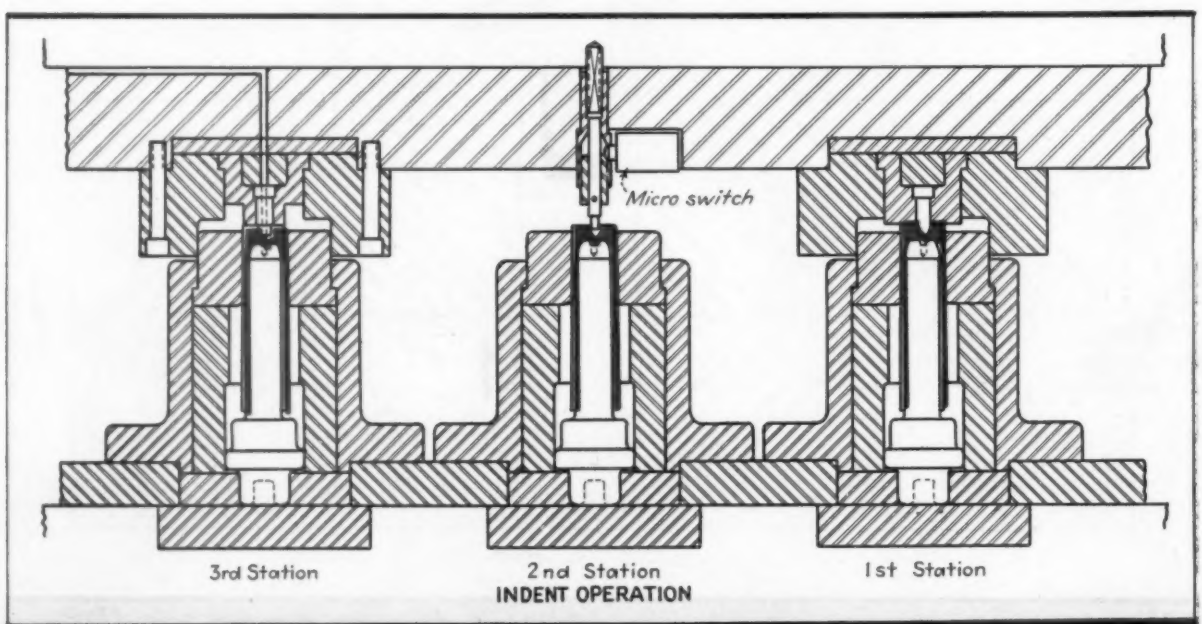
A true straight-line operation is not feasible, as it was not thought wise to spend the money or use the space to install separate annealing furnaces, pickling machines and washing machines for each operation. It is therefore necessary to run in batches through the anneal, pickle and wash and for that reason parts are discharged from the presses either through tubes or by means of small wire-mesh belt conveyors into low steel trucks mounted on rubber-tired wheels. These trucks are used to transfer the parts from the press to the washing machines and will dump into the washing machine loading hopper by means of tipping with an electric hoist.

After passing through the pickling and pre-coating machine, parts are discharged onto an inclined belt conveyor which carries them to an overhead belt run between the lines of draw presses. Hoppers are located at each press with chutes from the overhead belt. Each chute is fitted with plow-off gate operated by an air cylinder controlled by solenoid valve, which is properly set by the operator at the end of the pickling unit. It is therefore possible to dispatch each batch to its proper press from this point.

Wheeled Hopper Transports Cases

Parts are delivered directly from the second to the third draw and also from the fourth to the fifth draw. The same method is used from fifth draw to the V & O trimmers which follow that operation. After washing, before third draw trim and before indenting, the parts are delivered from the washing machine to an inclined belt conveyor which discharges them into a high hopper. This holds approximately the same quantity as the transfer trucks. The hopper is mounted on casters so that it can be wheeled into position alongside the trimming machine, or a hopper of different height can be filled and wheeled to the indenting presses. The lower end of the hopper is extended and serves as a stock bin for the operator.

After stress relief, parts are delivered to the screw machines in tote boxes, and after machining are dumped into the same type of low trucks as used in the press department. From the washing which



Indenting the primer hole is performed in two operations: breakdown at the first station and finish form at the third dial station. The second station is equipped with a feeler attached to a micro-switch for detecting a breakdown-indent peg that may have broken and stuck in the head of the case

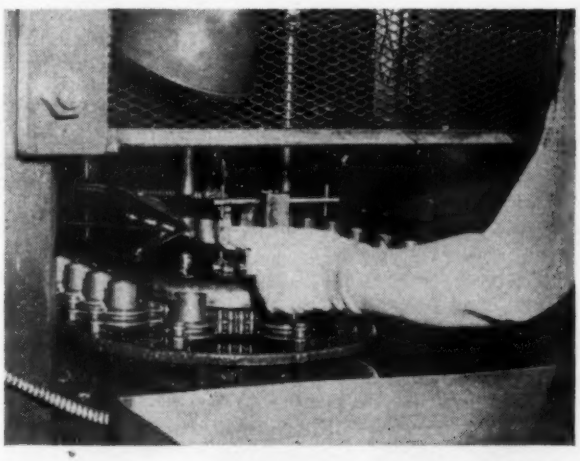
A dial feed is retained for the fourth draw because the 17-in. stroke press was retooled from brass production. Discharge is via tube conveyor

follows head turn, parts are carried onto a high belt with chutes leading to the piercing presses and with manually operated plow-off gates adjacent to each press. From the press they are placed by hand into stock boxes alongside the tapering presses.

Following wash after taper, parts pass through the same washing machine and are delivered to the same high belt line, discharging from the opposite side through chutes to mouth trim. After mouth trim, cases are placed on the return belt at an elevation of one foot from the floor and carried to an inclined belt that discharges onto a table ahead of mouth anneal. From this point all cases are handled in cardboard boxes, 10 in. square, each containing approximately 110 pieces. The boxes are placed on special trucks which will carry about 8,000 pieces.

This general arrangement keeps the handling cost at a low figure, gives flexibility so as to prevent complete stoppage when one or another operation may be in trouble. It is of course recognized that if the productive capacity of the plant were higher certain economies could be assured by a true straight line operation with no necessity for batching at any point.

It is not considered by any means that perfection has been reached in the manufacturing procedure as now carried out. Nevertheless, further improvements are detail in character. So it can be said that manufacture of the 20-mm. steel case has reached a practical status in process and production, as well as successful firing.



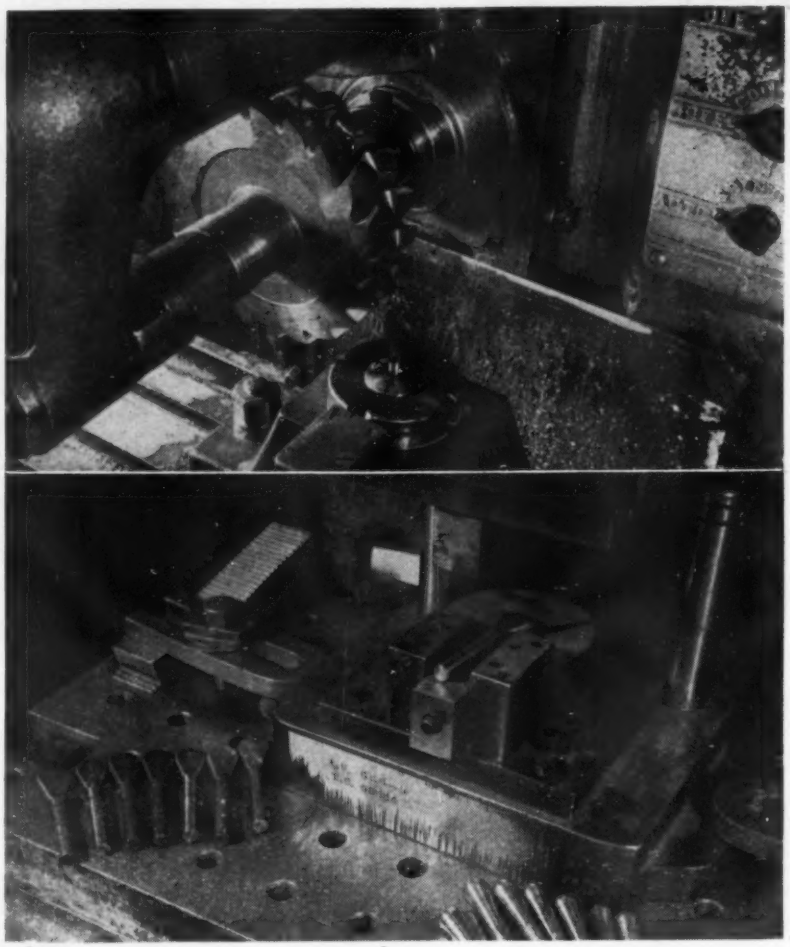
Chain feeds are fitted to the new presses added for drawing steel cases, because they are indexed with a smaller portion of the press stroke, and therefore the press can be run faster without increasing the actual drawing speed

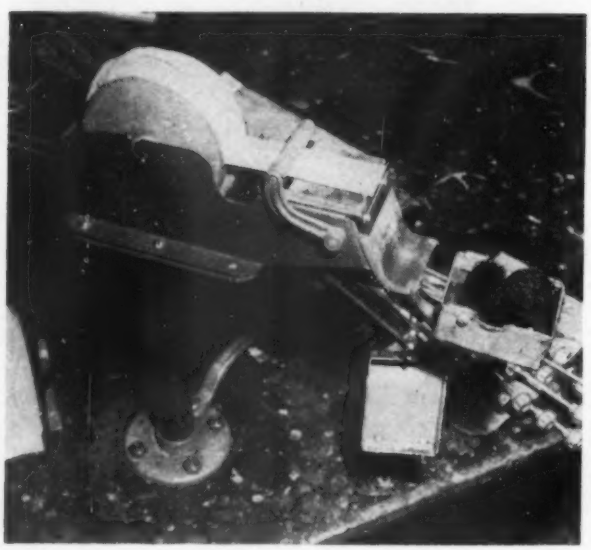
SHOP SHOTS FROM AIRCRAFT PLANTS

Cable ends were formerly made from bar stock in an automatic screw machine and then milled to secure the flats on the enlarged eye section. The eye sections are now flattened in a press instead of milling them with great saving in time and material.

One size of cable end formerly took several minutes to mill. It can be flattened at the rate of ten a minute by using a simple press tool. In flattening, the head bulges out so that when it is turned, it need not be as large as would be necessary for milling, where the turned size of the eye is also its final size. For example, one design of cable end was formerly made of 7/8 in. steel. The same piece is now turned from 9/16 in. steel, a saving of nearly 60 percent in material. A small cable end formerly made from 7/16 in. bar stock is now made from 1/4 in. material. With less stock to be removed, the screw machine operation is shortened.

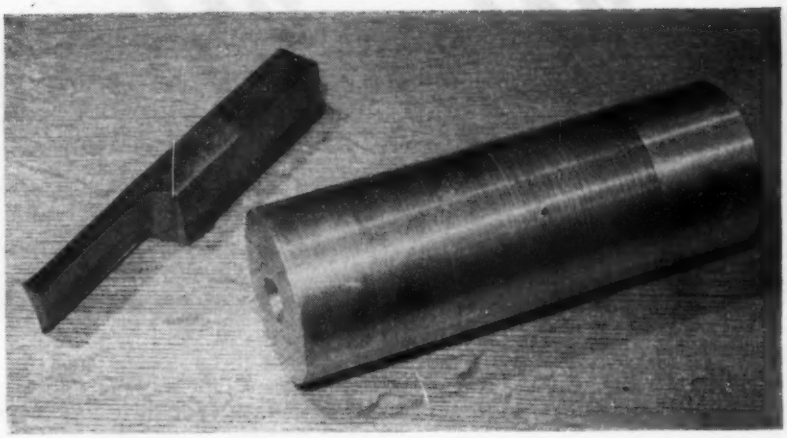
Another advantage is that cold working makes the part stronger. North American Aviation.





Dural tubing for gasoline, hydraulic and pressure lines is identified by colored strips of cellophane furnished in rolls with an adhesive backing. Then the strips are coated with lacquer. Formerly all of this work was done by hand, using a paint brush for the lacquering. A simple roll stand has simplified the operation. The cellophane roll is held on a reel while a piece of tubing is placed on the end of the strip, then the strip is pulled forward and cut off by a slight sideward motion against a knife edge. The cut off end is then sealed down by rolling it against a concave pad just below the knife edge. The tubing is then transferred to a felt-covered roller which dips in a small pan of lacquer and is rotated to complete the operation. Two-thirds of the time formerly required are saved. Douglas Aircraft Company.

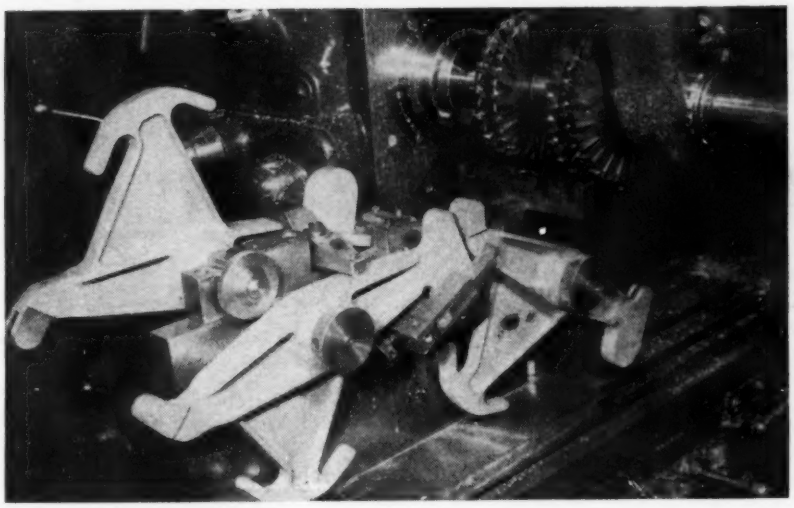
Collars, washers and other ring-shaped parts are made with a great saving in material by using a coring tool in place of drilling or boring. An annular slot is cut from the end of the bar; then the rings are sliced off, using a cut-off tool, leaving the center of the bar available for other work. The coring tool is ground to clear both inner and outer radii on the workpiece. Vega Aircraft Corporation.

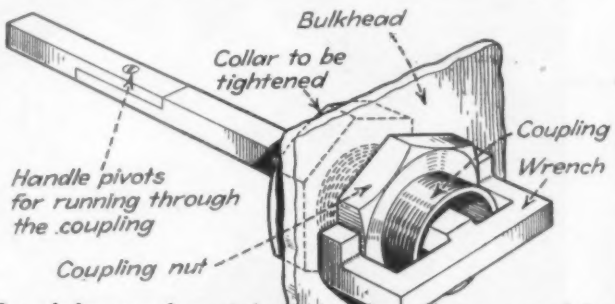


A forged aluminum bellcrank, for the Mitchell (B-25) bomber has three lugs which must be faced on both sides. Formerly they were straddle milled in three separate set-ups, but now a progressive milling fixture makes it possible to machine three pieces at once.

The fixture is aligned by and clamped to the table T-slot. It has three work holding positions, each of which locates a bellcrank for one of the three operations. The parts are held by their bores which have been machined in a previous set-up and are controlled in their angular positions by suitable stops.

The parts are moved from one position to the next at each pass of the table through the cutters. One new blank is added and one finished part removed after each cut. Two sets of straddle mills on a common arbor do the machining. Note that the cutter set-up at the right includes a parting saw which machines slots in two of the lugs. North American Aviation.

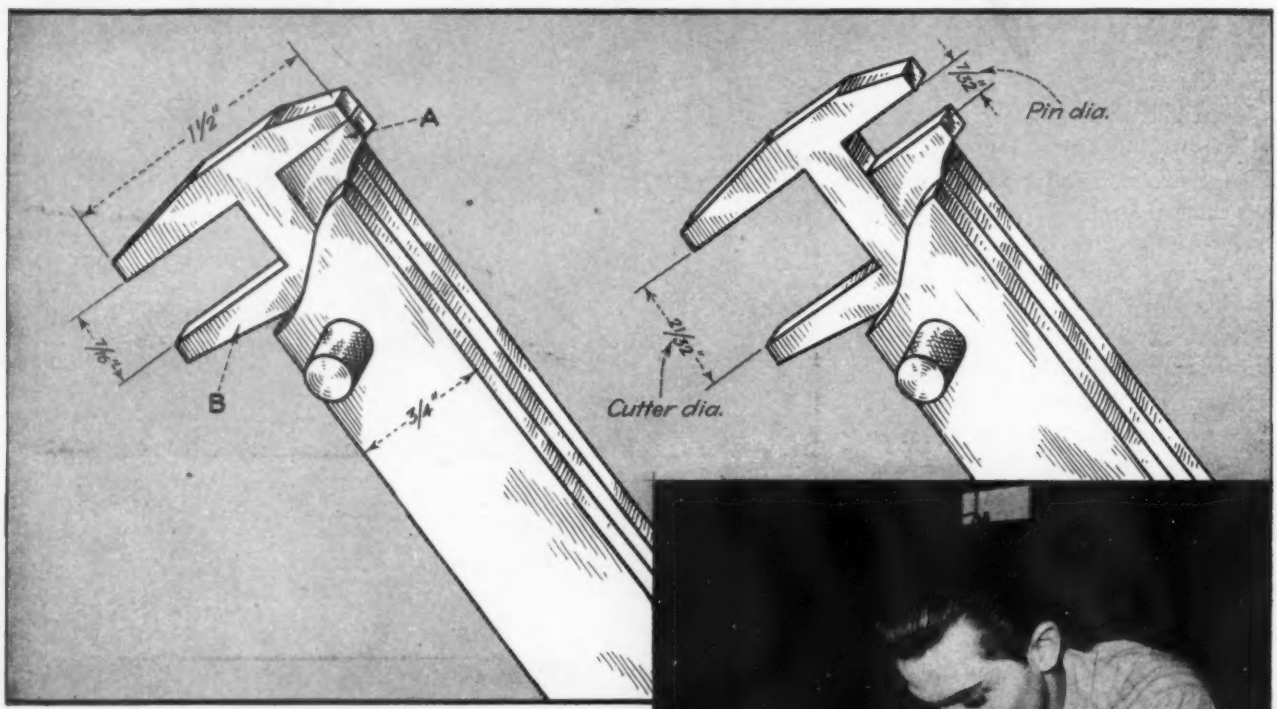




Special wrenches of the design shown here are used for holding conduit couplings in aircraft bulkheads while the coupling collar is being tightened. After the coupling is put through the bulkhead, the wrench is slipped through it. Then the workman goes to the other side of the bulkhead, slips the coupling collar over the wrench handles, and holds the coupling while tightening the collar. The wrench is then backed through the coupling. Its use takes the place of an extra man who would otherwise be required to hold the coupling on one side of the bulkhead while the collar was being put on and tightened from the other. Consolidated-Vultee Aircraft Corporation.

War Winning SUGGESTIONS

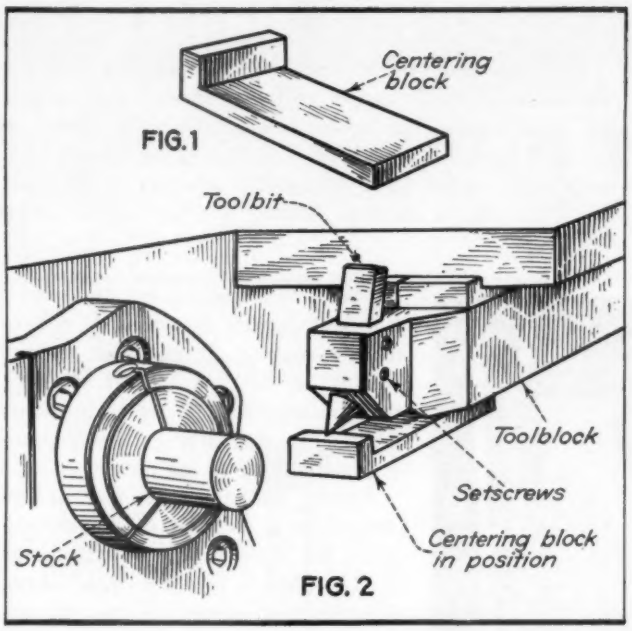
The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.



Caliper Simplifies Selection of Router Pins

The illustrated caliper is set to the diameter of the vertical milling cutter used in routing aircraft parts to templet shape, which setting automatically gives the correct diameter of the pin to be used with that specific cutter. This is possible because the caliper has two sets of jaws, one set of which is 7/16 in. wider than the other—the standard difference between the diameters of a cutter and its pin. The movable jaws of the caliper is set in fixed relation to each other, so that when jaw *A* is closed, jaw *B* is open 7/16 in.

In order to obtain the diameter of the pin, the cutter dimension is taken, and the diameter of the required pin is read from the scale on the opposite side of the caliper. This tool is useful where cutters have been sharpened many times. It enables the mechanic to select the proper pin quickly. *Suggested by Harry Becher, Northrop Aircraft, Incorporated.*



Centering Block Cuts Tool Set-up Time

When replacing dull or broken tools on some multi-operation machines where the tool is held by setscrews in a face-releasing block, it is sometimes difficult to bring the cutting edge to its proper relation with the axis of the machine spindle, especially when the toolholder is in an inaccessible place and out of sight. Frequently, the toolbit is set off the center line, causing low tool life, improper finish, scrapped work, and loss of time in making trial cuts to secure proper adjustment of the toolbit. The illustrated block overcomes these factors.

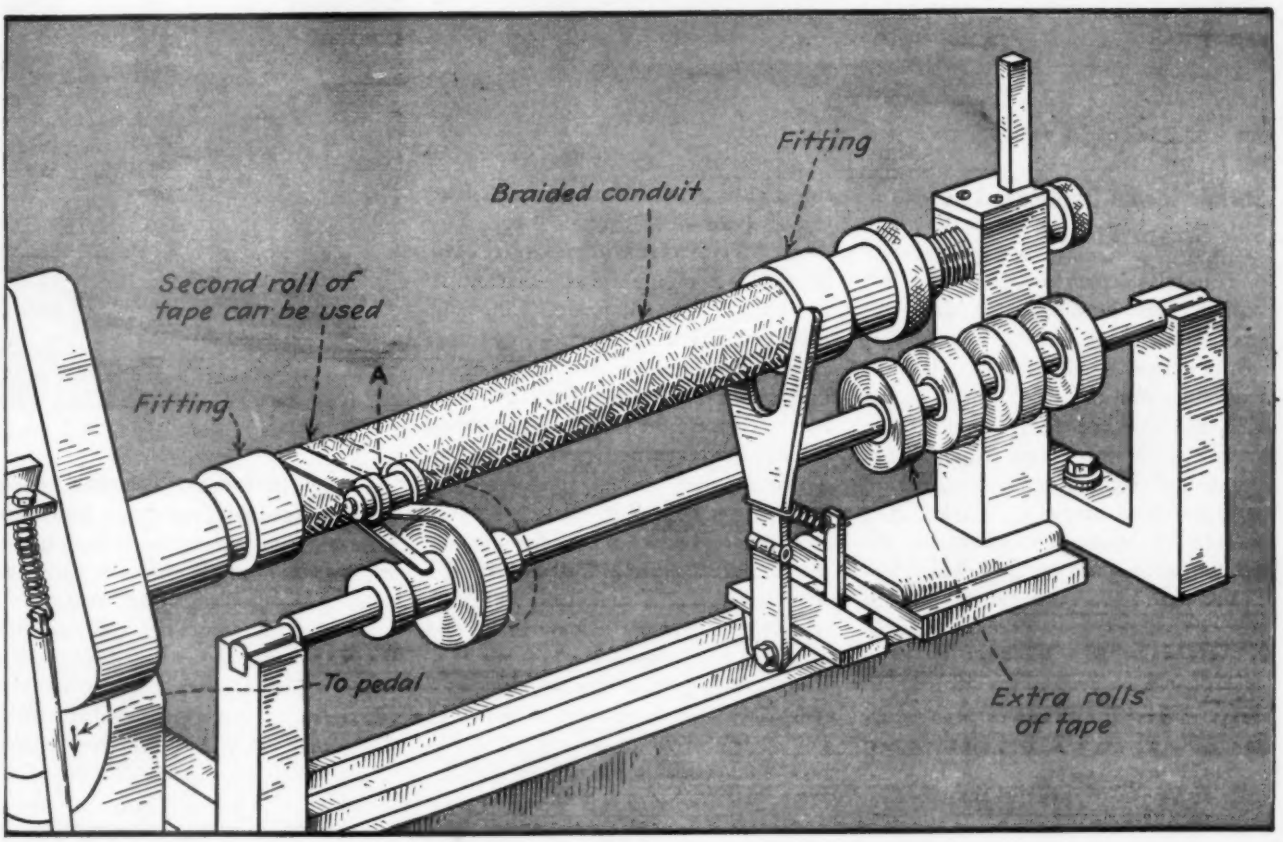
When held against the under surface of the toolblock, as shown in Fig. 2, toolbit can be set instantly with its cutting edge coinciding with the horizontal center line of the stock. The block is held in this position until the toolbit setscrews are tightened, and is then removed.

Toolbits can be set accurately in 2 min. with the aid of this centering block. Previously, the setting required from 5 to 15 min., but on frequent occasions trouble resulting from improper centering required hours of adjustment. *Suggested by Mitchell Kafarski, Aircraft Engine Division, Packard Motor Company.*

Guide Roller Speeds Taping of Braided Conduit

The conduit shown in the illustration, made of braided hose 1½ in. in diameter and 12 in. long, has couplings at both ends and is to be covered with friction tape. It is general practice when applying the tape to mount the conduit of a motor-driven spindle, put the roll of tape on a bushing slidable on a stationary bar parallel to the conduit, and as the conduit turns to feed the tape onto it. The tape is guided by hand during this operation, often causing the operator to burn his hand. Furthermore, the tape is not always overlapped evenly, and but one roll of tape can be used on the stationary bar.

These undesirable factors have been eliminated by the



addition of guide roller *A* to the taping machine. It is similar to a tension idler on belt drives, except that the roller is attached to a spring anchored in the bushing on which the roll of tape is mounted. A second roll of tape can be used successfully with the roller, as indicated by the dashed lines. As many as 12 rolls of tape can be placed on the stationary bar.

Tape can now be applied and overlapped evenly on the conduit without danger to the operator. As a result, the spindle speed can be increased, turning the conduit at sufficient speed to double production. It is estimated the guide roller saves 3,700 man-hours annually on this job. *Suggested by Valentine Watts, Titeflex Metal Hose Company.*

Shrink Scales Duplicated by Silk Screen Process

The silk screen process here described was developed to duplicate steel rules and shrink scales when manufacturers could not supply them without undue delay. The silk screen with rubber blanket *A* on the inside surface is held on frame *B*, which can be swung from horizontal to vertical position about hinges *C*. Blanket *A* is formed of synthetic rubber, or the silk screen may be sprayed with plasticized clear lacquer, since natural rubber will not last under the chemical reaction of the ink used.

The outside surface of the silk screen is heavily lubricated with vaseline. Shrink scale *D* to be duplicated is fixed in position on the table to register on the rubber blanket, using stop blocks *E*, and is inked with offset printer's ink with either a roller or brush. The screen is then closed over the scale, bringing rubber blanket *A* in contact with the scale. The silk surface of screen, previously lubricated with vaseline, is rolled with a Brayer printer's roller, forcing a uniform contact between the rubber blanket and original scale *D*. The screen is then opened and bears the offset impression *F* in ink.

A blank strip of metal for the duplicate shrink scale is then substituted for the original shrink scale, positioning it against stop blocks *E*. The screen is then closed, the vaseline surface is rolled, and the screen is opened after the impression of the original shrink scale on the blanket has been transferred to the blank metal.

The duplicate shrink scale is then removed and sprayed on the reverse side with lacquer as a masking or protective coating against the etching solution to be used. After spraying, the duplicate scale is set aside to dry thoroughly, the drying time depending on the type of ink used.

Finally, the duplicate scale is immersed in a solution of copper sulphate for about 4 min., using trough *G*. The scale is then removed, rubbed vigorously to remove all ink and sulphate residue, and trimmed to required length. The metal blanks used

are slightly longer than the actual scale to facilitate registry. India ink is then wiped into the etched markings for visibility. After drying, the scale is laquered to prevent rusting.

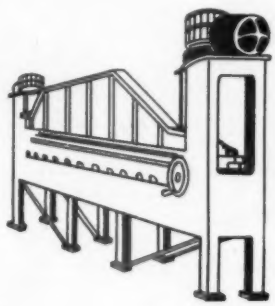
This cycle must be repeated for the duplication of additional scales. The process is also used for the duplication of markings on templets. *Suggested by Robert L. Joyce, Airplane Division, Curtiss-Wright Corporation.*

AMERICAN MACHINIST REFERENCE BOOK SHEET

Methods for Forming Aircraft Sheet Metal—V.

Courtesy Douglas Aircraft Company

CONTOURING ROLLS



Rolls straight contours in sheet metal

Machine Efficiency

A=Excellent; B=Good; C=Fair; D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	A	A	B
5-50	A	A	B
50-500	A	A	B
500 & Up	B	B	B

NOTES:

Die cost—none
Set-up cost—none
Operating cost—moderate

All sheet metals can be formed on bending rolls, within their limiting bend radii.

Design Considerations

1. Compound bends cannot be made on contouring rolls. Such bends must be made on the Hydro-Press, or by other, more costly methods.

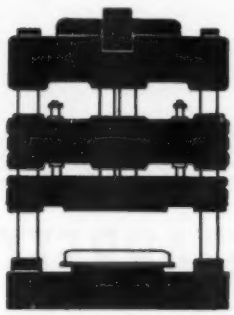
2. It is extremely difficult to bend sheet metal in a complete circle to less than 2 in. radius.

3. Tapered roll sections may be formed without difficulty.

Limitations

Width, gage of stock, minimum radius of contour formed depend upon the size and power the machine installed. Usually there is no limit on the length of sheet that can be handled, unless formed to more than 180 deg.

DEEP-DRAW PRESS



A medium-production machine which can form parts by a controlled drawing action

Machine Efficiency

A=Excellent; B=Good; C=Fair; D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	C	C	A
5-50	C	B	A
50-500	B	A	A
500 & Up	A	A	A

NOTES:

Die cost—high
Set-up cost—high
Operating cost—low
Experimental cost—often very high

Materials Formed

1. Aluminum (2SO, 3SO) has the best forming characteristics. Grade 52SO work-hardens rapidly, and therefore is not as adaptable as other soft aluminum.

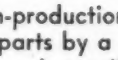
2. Aluminum alloy — Soft stock (24SO, 24SOAL) will form on limited draws, but work-hardens very rapidly. Hard stock (24ST, 24STAL) has excess springback, and rapidity of work-hardening prevents deep drawing.

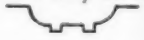
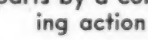
3. Magnesium alloy — No deep-drawing work on this metal has been done as yet, but appears feasible.

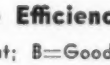
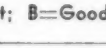
4. Corrosion-resisting steel (18-8) can be formed in the full-annealed condition only.

Design Considerations

In designing for deep-draw press, consider:

1. Part can be formed best if symmetrical. This , preferable to this  .

2. Holes can be formed only in direction of draw. This  , not this  .

3. Angle of draw should be symmetrical, and as wide as possible. This  preferable to  .

4. Both inside and outside draw radii, as well as corner radii are, critical.

5. Consider whether right-hand part and left-hand part, or two similar parts, can be made in one draw, then cut in half .

6. Ductility of material affects success of draw; therefore specify only 2SO or 3SO for severe draws.

Limitations

For a 650-ton press of one type, the maximum die size is 58×119 in.; the maximum practical draw, 19 in.

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Today the STARRETT *name on a precision tool* MEANS MORE THAN EVER

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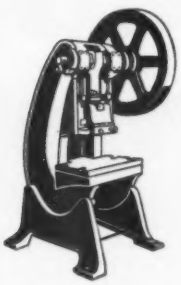
AMERICAN MACHINIST REFERENCE BOOK SHEET

Methods for Forming Aircraft Sheet Metal—VI

PUNCH PRESS



A high-production machine capable of blanking, forming and drawing metals

Machine Efficiency

A=Excellent, B=Good, C=Fair, D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	D*	D*	A
5-50	D*	D*	A
50-500	B*	C*	A
500 & Up	A	A	A

* Punch press cheapest and most efficient method if notching dies can be used.

NOTES:
Original die cost—very high
Set-up cost—moderate
Operating cost—very low

Materials Formed

1. Aluminum (2SO, 3SO) has excellent forming characteristics and is very good for draws.

2. Aluminum alloy (24SO, 24ST) in both hard and soft stock is used extensively. Hard stock is usually specified for simple blanking and forming operations; soft stock for more severe forming operations.

3. Magnesium alloy (MA, MH, AM3SO, AM3SH)—use of this metal has not been developed.

4. Corrosion-resisting steel (18-8) blanks and forms exceptionally well.

Design Considerations

In designing any small sheet-metal part which is to be manufactured in large numbers, consider that some or all of part may be formed on a punch press. Therefore:

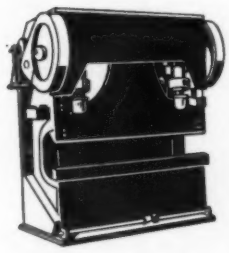
1. Specify standard notches, cut-outs, bend reliefs as these are all made by standard punch press dies.

2. Consider die clearance for all punching operations near flanges, beads and joggles.

Limitations

Limitations of punch press operations are usually limitations of individual dies.

POWER BRAKE



A medium-production machine for forming straight break flanges and similar shapes

Machine Efficiency

A=Excellent; B=Good; C=Fair; D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	A	A	B
5-50	A	A	B
50-500	A	A	B
500 & Up	B	A	B

NOTES:
Die cost—All standard dies used
Set-up cost—low
Operating cost—moderate

Materials Cut

1. Aluminum (2SO, 3SO) has excellent forming characteristics.

2. Aluminum alloy—Soft stock (24SO, 24SOAL) is easily bent to small radii. Hard stock (24ST, 24STAL) will form well, except that part has to be overformed to allow for springback.

3. Magnesium alloy (MA, MH, AM3SO, AM3SH)—Not particularly adapted to power brake forming, but may be done on large bend radii.

4. Corrosion-resisting steel (18-8) will form exceptionally well in all conditions of hardness.

Design Considerations

Fundamental principle in designing for power brake is that punch must be able to form part without locking on machine (including overforming angle for springback).

Minimum radius tends to mark the parts. Use slightly larger radius where this is possible.

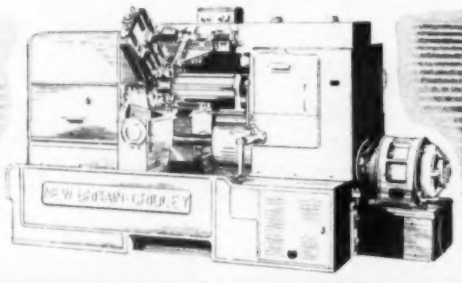
Limitations

Minimum flange height depends upon material and bend radius. With 24SOAL and 24STAL in 0.025 in. gage, the height is 3/16 for a 1/16 in. radius; 13/16 for a ½ in. radius.

Figure it out

FOR YOURSELF

For war work or postwar manufacturing, when you have weighed all the factors . . . if it's PRODUCTION you want, you'll find everything adds up to NEW BRITAIN AUTOMATICS.



NEW BRITAIN AUTOMATICS

NEW BRITAIN-GRIDLEY • MACHINE DIVISION
THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONN.

ARMY E NAVY

Needed—Ground Rules

THE OTHER EVENING we heard the head of a great corporation outline his company's after-the-war plans.

He is optimistic about the size of the market that will exist for his product. He believes that it will require an output 25 to 50 percent larger than in any previous peacetime year.

But the burning question is how long it will take the company to convert from war to civilian manufacture. He remarked that the period would be little or much, depending upon whether "things are right."

His meaning is not hard to grasp. Certain fundamental things must be done before a good start can be made on reconversion.

As much advance notice as possible must be given of the termination of war contracts. To leave a company high and dry without warning is indefensible so long as any inkling of the action might have been known ahead of time. Such advance notice will enable the management to set in motion the machinery of readjustment.

Contract settlements must be made quickly after war production ends. It is no exaggeration to say that thousands of companies have most of their working capital tied up today in metal and plants and payroll, because they have been compelled to expand so sharply to meet their war obligations.

These companies will be desperately in need of cash. To hold up payments of a substantial portion of the money due contractors until the comptroller-general's office has checked every minor detail would be a costly and delaying action.

Some system must be provided whereby manufacturers can secure working capital in a hurry. Possession of adequate working capital may spell the difference between weeks and months in getting started again in civilian production.

War plants must be cleared promptly of all machinery, equipment and materials belonging to the federal government. Until this is done, a company is helpless to retool its factories. And often, as in the case of the automobile industry, plants are interrelated and one is of no value without the other. The clearing of one specific factory may be of no service whatsoever unless ten other factories are freed at the same time.

All of these things, and many more, must be done before industry can move ahead effectively.

Industry knows that it has a great responsibility after the war for the employment of millions of people. It has no intention of shirking that responsibility.

But if it is to do its job well, it must know the ground rules under which it will be expected to operate. Those rules have not yet been determined by the federal government. The sooner they are determined, the better industry can proceed to make and carry out intelligent plans, and the shorter will be the interim between the cessation of war and the resumption of civilian production on a large scale.

Burnham Finney

Gaging Business

Marked progress is being made in finding ways and means of utilizing labor so that higher war production per manhour is attained. In the Southern California area alone aircraft plants estimate that up until March 1 they will need 50,000 fewer men than originally contemplated. Further reductions in manpower demands appear to be in the making from all sections of the country.

Washington is watching closely to see that every factor contributing to wastefulness in manpower is eliminated. For one thing, cost-plus-fixed-fee contracts are giving way to employer incentive and fixed-price contracts. Business taken on the latter basis leads to a "watch-dog" policy by management regarding labor efficiency and labor costs.

Airplane production is climbing. In November it is expected to be at least 8,900 units and may go over the 9,000 mark for the first time. Of the total, about 1,000 will be the larger bombers. At mid-November output was running about 500 planes ahead of October. October was the first month in which more airplane factories met or exceeded their schedules than were below them. Considerably more than 5,000 combat planes a month are being made.

Reduction in the number of types being manufactured, fewer changes in design, increasing manhour output and more managerial know-how are helping to boost aircraft output.

Now at an all-time high, war production in general is believed at its peak. Attempts to shove it still higher are not expected to result in much improvement. Roller and ball bearing output is a major bottleneck. The industry's capacity is not large enough to meet present and future requirements, especially if the huge motor truck program for 1944 is not pared down. Army wants upwards of 1,000,000 trucks, including 80,000 having capacity of four tons or more. These heavy-duty units total 11 times the best prewar production year.

The truck program will run head on into the farm machinery and construction machinery programs in the matter of critical components such as engines, axles, transmissions and gears. Tightness goes back to the forge shops and foundries, where manpower shortages have cut operations far below the desired full capacity. WPB may try to get the Army to trim its spare parts needs to help ease the overall pressure for components.

Shipbuilding is continuing at the peak. Ordnance production is declining in some items because of the accumulation of finished goods. The Army has begun the task of dismantling some entire ordnance plants and others have been converted to other war uses. Arsenal equipment is being upgraded, the Army getting rid of 40-year-old equipment in the process.

New machine tool business is likely to stabilize around $30,000,000 a month. This is apart from the non-machine-tool contracts secured by the industry. Automobile companies have placed a sizable number of orders with machine tool builders in anticipation of the resumption some day of automobile manufacture. These orders are tentative and merely mean that these automotive buyers hope to get preferential treatment when Washington permits production of machine tools again for peacetime purposes.

The British have agreed to take half of their 1944 requirements of construction machinery from the United States in used equipment. Some of it will come from the $38,000,000 worth to be liquidated from the Alaskan Highway job.

Further cutbacks in production of many raw and semi-finished materials are inevitable. Surpluses continue to pile up at rates that will force reductions. High-cost output will be stopped first.

Gains of Miners' Unions Will Inflame Labor Front

Successful by-passing of the Little Steel formula has opened labor leaders' hunting season; each will strive to bag equivalent pay increases for his union

NEW YORK—The wage stabilization program is being seriously shaken, but it still stands. That is the important reality behind all the verbiage that has attended the settlement of the coal wage dispute, the C.I.O. announcement that it will press for substantial pay boosts, the controversy over railroad employees' rates, and a series of official and unofficial statements from National War Labor Board members.

John L. Lewis found a way around the Little Steel wage control formula, providing that hourly pay rates shall not exceed 15 percent above where they were January 1, 1941. Coal miners' increases come in the form of payment for more overtime, a shortened lunch period, cash vacations, payment for tools and equipment, and compensation for travel time from portal to portal.

Net daily gains for coal miners under their new agreement come to more than $2 a day but, technically, they did not breach the Little Steel formula. Consequences are two-edged.

A Face Saver

First, the Administration and its National War Labor Board is able to maintain that its 15 percent limitation still holds. It will play this argument to a fare-the-well in putting pressure on Congress to provide subsidy funds with which to hold and/or roll back the cost of living. It will also keep reminding raise - demanding labor groups that the old rule still applies.

But more profound consequence of the coal settlement is that John L. Lewis has established par for the course. In other words, his more-than-$2 gain in daily pay is what every other labor leader in the country has to shoot at. Terrific pressure will be upon them to get equivalent benefits for their members. If they can't, they lose stature, prestige, even their jobs.

Peculiar to Mining

Few other industries can provide the pretexts that were found in coal for increasing daily pay without boosting base rates. Many of the important war industries are already working a 48-hour week or are on schedules which cannot be increased without impairing efficiency, increasing absenteeism, and losing production.

It follows, therefore, that if steel workers, for example, are to get appreciable pay boosts, their hourly rates will have to be increased. For that reason Lewis has set in motion forces which will work to remove the hourly rate limitation.

Led by the United Steelworkers of America, C.I.O. unions in the basic industries are winding up for an all-out assault on the 15 percent formula.

Meanwhile railroad unionists are waging a frenzied campaign of their own to push through wage boosts.

But the important thing to remember is that the strife is still ahead, that four coal strikes settled only the coal controversy. Every other industry will have either to go through the same labor pains or Washington will have to retreat on wage control.

Will Try Other Means

Meanwhile, other concessions to unions will be freely dispensed. Maintenance of membership contracts will be ordered by NWLB into an expanding industrial area. Severance pay contract clauses will be written into contracts. Vacation allowances will be increased.

All these concessions will be offered under the sponsorship of NWLB in an attempt to buy off union demands for higher hourly wages. But it is already clear that they will not be successful. Short of a real price rollback, which seems a utopian expectation, there is no forestalling a major clash within the next three months which will keep the labor front in a blaze.

FORD TELLS POSTWAR PLANS

DETROIT — The giant Willow Run plant will be bought from the Defense Plant Corporation and continued in operation after the war by the Ford Motor Company, to build a giant multiple-engined cargo-passenger plane of unique design which may revolutionize air travel as the Model T did to automobiles, Henry Ford himself has disclosed.

The company has first option to purchase the $60,000,000 plant near Ypsilanti and it will take up the option, Mr. Ford stated. The plant now is the largest producer of completed and knock-down B-24 Liberators in the country, the company revealed this week.

"Our first reason for taking up the option is to create jobs for people who will need them," said the elder Ford, who resumed presidency of his company at 80 on the death of his son Edsel.

"Some say the people in Washington will not let us have the plant but we have too much faith in the government of the United States to believe anything like that. We know that the government is just as much interested in postwar jobs as we are."

It is believed that Charles A. Lindbergh has been working on the design of the plane with Ford engineers. He has also been working on a high-altitude plane engine. The elder Ford said the cargo ship was in the model stage but would set a new low cost of operation.

Combat Component Shortages in Effort to Speed Major Programs

WASHINGTON—The War Production Board is fighting to break serious component bottlenecks threatening to interfere with the production of military trucks and small naval vessels in 1944, besides disrupting plans for production of farm machinery and construction machinery. Special committees have been set up to handle the problem, and Joseph E. Adams, materials officer and right-hand man to Hiland G. Batcheller, vice-chairman in charge of operations for WPB, has been assigned to look into the matter.

If at all possible, WPB would like to hammer through the truck program for 1944, but general opinion is that it will have to be scaled substantially below the present figure of 1,000,000 vehicles, of which about 10 percent are expected to be extra-heavy vehicles. Industry's capacity may turn out only about 75 percent of the program, unless component bottlenecks are broken. To this end, WPB has already arranged with the Army to reduce its spare parts ratios to cut down component requirements. Also, plans may be undertaken similar to the bearings program to break the other component bottlenecks.

Although the bearings program is still in its early stages, WPB officials say that many users have already cut down their stated requirements, and high hopes are held that some bearings may be recovered from inventories at airplane plants. Meanwhile, the report that the machine tool in-

(Continued on page 124h)

Annual Meeting of A.S.M.E. to Streamline Information Exchange

NEW YORK—Geared to an immediate exchange of war production information, and with registrations indicating a record attendance, the annual meeting of The American Society of Mechanical Engineers is scheduled for the Hotel Pennsylvania, here, November 29 to December 3.

Sunday—the opening day—will be devoted to meetings of the executive committee of council, the entire council and of the local sections delegates.

The period from Monday morning at 9:30 A. M. to Saturday noon will be occupied by technical sessions, luncheons and dinners. Time limitation has made it necessary to schedule from five to seven sessions simultaneously during each period.

The annual banquet will be held Wednesday evening, December 1, with Ralph S. Damon, vice president and general manager, American Air Lines, delivering the principal address, "Aviation During and After the War." The honors and awards for 1943 will be presented at the dinner and a number of distinguished engineers will receive certificates of honorary membership. Engineering awards from other sources, also scheduled for presentation at the dinner, will be the John Fitz, the Henry L. Gantt and the Hoover medals, and the Nobel Prize.

Ralph S. Damon

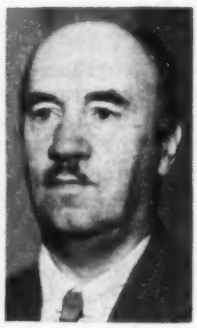
To Install Officers

Robert M. Gates

Officers elected during past months by letter-ballots will be installed at the banquet. Robert M. Gates, president, Air Preheater Co., will succeed Harold V. Coes in the office of association president. Vice presidents-elect are: Rudolph F. Gagg, Wright Aeronautical Corp., David W., R. Morgan Westinghouse Electric & Mfg. Co.; Jonathan A. Noyes, Sullivan Machinery Co.; and Ford L. Wilkinson, Jr., Speed Scientific School.

Four managers were elected on the same ballots and will also be inducted at the banquet: J. C. Brown, A. C. Chick, S. H. Graf and J. M. Robert.

Lewis K. Sillcox



Igor I. Sikorsky

A wide variety of subjects will be covered in the various technical sessions. A symposium devoted to high-cycle milling will have as participants Einar Almdale, Hans Ernst, H. A. Frommelt, Ralph G. Hummer, L. W. Kemp and Frederick W. Lucht, Jr. A session on metal cutting research will hear papers on "Elements to Be Considered in Milling Steel with Cemented Carbide Tipped Milling Cutters," by Frederick W. Lucht, Jr.; "Standardization of Tool-Life Tests for Evaluating the Machinability of Single-Point Tools, Cutting Fluids or Materials Cut," by O. W. Boston; "Practical Cutting-Fluid Recommendations for Use with High-Speed-Steel Tools," O. W. Boston, H. L. Moir, E. M. Slaughter and W. H. Oldacre.

Will Read Papers

Sessions on production engineering will hear papers on "High Speed Spar Milling," by Paul Dubosclard; "Analysis of Stretch-Forming Double-Curved Sheet-Metal Parts," by R. B. Glassco and N. O. Myklestad; "Wear-Resisting Materials for Lathe Construction," by R. W. Dayton, C. H. Lorig and R. E. Adams; "New Methods of Testing Bearings for Noise," Ernest J. Abbott; "Electronics as Applied to Motion," Frank H. Penney, and "Accurate Prediction of Machine Productivity for Future Applications," G. B. Carson.

A symposium devoted to chip control will hear the reading of four papers: "Increasing Tool Life by Better Tool Finishing," V. H. Ericson; "Chip Control with Sintered Carbide Tools," M. F. Judkins; "Standardization of Chip-Breaker Type of Fine-Finished Single-Point Cutting Tools," Carl J. Wiberg; "Practical Aspects of Chip Control," Frank J. Oliver.

John F. Campbell, James F. Lincoln and John W. Nickerson will read papers detailing a survey of incentives under wartime conditions.

Forging of steel shells will be discussed at one of the technical sessions; papers to be read are: "The Flow-of-Metal Problems in Shell Forging," M. D. Stone; "Piercing of Steel Sheels," W. Trinks; "Drawing of Steel Shells," George Sachs; and "Nosing of Steel Shells," A. Nadai.

C. B. Bryant will read his paper on the "Possibilities of New Materials to Be Used in Railroad Equipment in the Postwar Period," and Edward G. Budd will read of "Passenger Cars for the Postwar Period."

TO RECEIVE A.S.M.E. AWARDS

THE A. S. M. E. MEDAL—Lewis Ketcham Sillcox, first vice president, New York Air Brake Co.

THE HOLLEY MEDAL—Vannevar Bush, president, Carnegie Institute of Washington.

THE WORCESTER REED WARNER MEDAL—Igor Ivan Sikorsky, Vought-Sikorsky Aircraft.

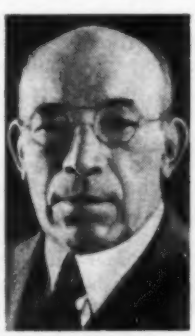
THE JUNIOR AWARD—Troels Warming, Nordberg Manufacturing Co.

THE CHARLES T. MAIN AWARD — Mitchel Christopher Kazen, of University of Detroit and Cook Engineering Co.

THE UNDERGRADUATE AWARD—William Langdon Hutton, Princeton University, Ensign, U. S. N. R.

To be Installed as Vice Presidents for Coming Year

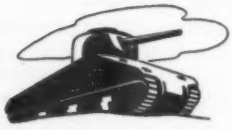
Underwood
Rudolph F. Gagg



David W. R. Morgan

Jonathan A. Noyes

Blackstone
Ford M. Wilkinson, Jr



Inside Detroit

Civilian truck output has become an official "must," to forestall breakdown; Ordnance will spur the program. Set component production rates. Object to government in business. Services enter mail order field. UAW continues push at the Willows

BY SILER FREEMAN

Civilian Trucks Will Go Through The last word is that the civilian truck program will go through, notwithstanding the anguished cries of the services. In fact, the Ordnance Department itself will exercise supervision to see that the component parts for 123,492 trucks will be made on time. Of this number, 92,057 are medium, 21,030 are light-heavy and 10,405 are heavy-duty trucks. Completion of this number is assured by giving the program top priorities with high-octane gasoline and aircraft.

Production will get under way slowly during the first half of 1944, but must accelerate toward the close of the year. Much machinery ordered by truck builders, last summer, and stalled by higher priorities on other programs will now be released for manufacture. Expansion of truck-building facilities will go forward at once.

ODT Had to Pull Against Services It has been a tough battle for truck manufacturers to make the brass hats in Washington see the light. The Office of Defense Transportation has been sympathetic with their pleading for a co-ordinated truck program. Pooling of component parts has been approved to assure that all builders will get sufficient axles, transmissions, gears and engines to produce complete trucks.

But Ordnance has been adamant that its needs come first, what with invasion tempo stepping up and a new front drawing nearer to reality. Reliable sources state that it took a word from the top to change Ordnance's mind and enroll it on the side of civilian needs.

Only recently a momentous meeting was held in the offices of Undersecretary of War Patterson in Washington. The big names in the auto industry were there. They presented ponderous evidence that if the truck transport of the nation was allowed to go on another year without replacements, the arms program would suffer with it.

Replacements Insufficient Since more than 80 percent of all materials moving in and out of war plants in the Detroit area come by truck transport, the argument was convincing. The replacement parts program was insufficient to insure the continuation of the movement of vital freight on wheels.

Army chiefs were called in and told of the danger. The big stick was said to have been wielded to make Ordnance back down on its demands and agree to give the truck builders sufficient materials, parts and components to insure a minimum for civilian use in its truck program.

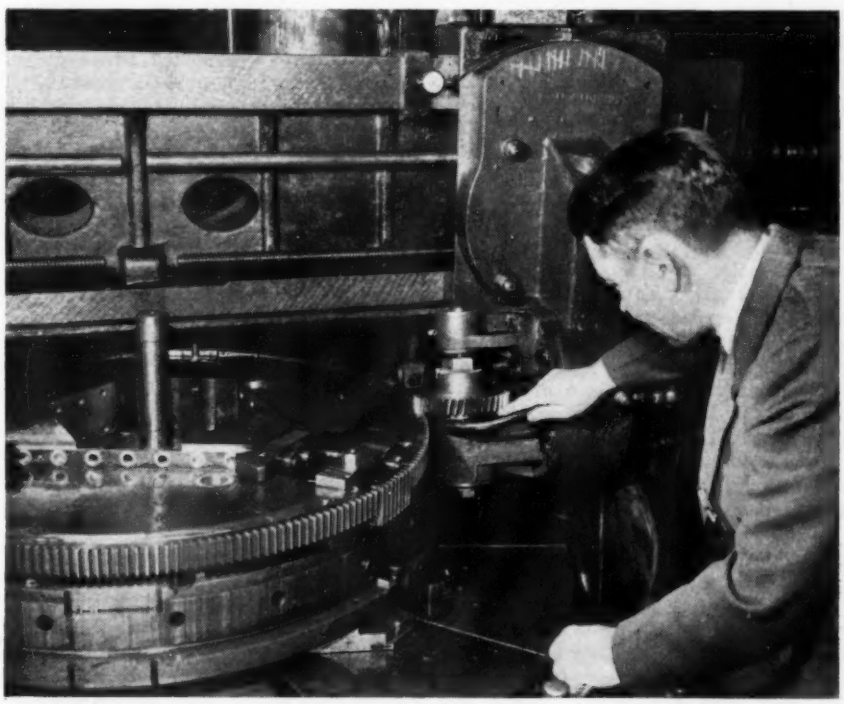
Truck, Ordnance Officials Meet To lay the basework, 14 of the largest truck manufacturers met with Ordnance officials in Chicago and were assured that the Army would see to it that a certain percentage of production of gears, axles, transmissions and engines would be shunted to the civilian end.

Armistice Day another such meeting was held in Detroit with the motor truck advisory committee, as well as the motor truck manufacturers not represented on the committee conferring with R. L. Vaniman, head of the War Production Board's automotive branch. Thirty-four manufacturers had delegates to the meeting, which was a closely guarded one.

But the lines were drawn for what was going to happen in 1944 and civilian replacements seemed assured. Percentages of vital components' production were specifically set out by Ordnance. The manufacturers' only objections to the setting up of percentages were that the percentages were not "across the board". For example, only 3 percent of the axle production was assured for civilian trucks while about 8 percent of the engine production for the heavy type was set up and about 5 percent for the transmissions.

Urge "Across the Board" Output The manufacturers pointed out that to keep their schedules on an even keel, the allotments must be "across the board," the same for each vital component. This is a point that was not settled at once, it was learned, and may still need an order from the top to bring it into line.

But the truck makers were assured a chance to help out the civilian truck problem which has been growing acute by the day. Common car-



Adaptation—With a boring mill, fitted with an adaptor to hold the cutting tool, Pontiac Motor Division machines teeth in the elevating arc of the Bofors gun, has by-passed a two-year wait for a shaving machine, and has reduced rejections by 80 percent. The work is driven and the cutting tool stationary

riers and contract haulers have been worried by lack of parts, tires and mechanics. Many of them have hundreds of trucks tied up for lack of service. Replacements will give them a new lease on life.

The only item which is still irking the truck men, is the fact that only medium and heavy trucks are on the civilian program. No provision is made for light vehicles. There is some doubt that the goal can be reached on heavy trucks and provision has been made to replace them with added mediums on a two-to-one basis.

Object to WPB As Tool Dealer

Machine tool manufacturers are glum these days because of competition from a new source. The new source is the War Production Board and the Army Air Forces, which has been picking up idle machine tools and peddling them, so to speak, among war firms.

Both the WPB and AAF have collected an assorted inventory of machines and machine tools of all varieties which they circularize widely. A little pressure is also reported on the plants to come to the government agencies before sending in orders to manufacturers.

"It is cutting into our new business," moaned one tool manufacturer.

AAF Enters Mail Order Field

There are a lot of good laughs to be had out of the fancy catalogue that has been put out by the 830th Army Air Forces specialized depot at Memphis, Tenn. The catalogue advertises and seeks bids for the many items which have been collected by the depot as no longer useful to the AAF.

It is an expensive catalogue, printed on good paper and liberally illustrated with the surplus goods. Some wags suggest that the government will be lucky to break even on the printing job from the sale of the items it advertises.

In the 32 pages can be found anything from screws and bolts to flying suits and felted boots. There are bullet-sealing fuel tanks of all sizes and descriptions for which one manufacturer of the tanks said he would offer about $4 a gross; airplane wheels, lubricants, solvents, hand tools of all kinds, airport equipment, etc. It is a heterogeneous mass.

No Incentive To Purchase

This is not the only catalogue which has been out by the depots and this like the rest is being greeted coolly. It is pointed out that priorities are required and only bids are asked. There is no assurance the bid will be accepted nor in what length of time. Those interested find it easier to order directly form the normal sources.

But it IS a pretty catalogue.

UAW Woes at Willow Run

Willow Run is again being beset by labor woes, after a short period of smooth sailing during which it reached a new high for production of completed and knocked down Liberators. It was threatened by a complete shutdown on Wednesday (Nov. 10) as the result of die setters demanding a 10-cent-an-hour increase and a definite classification instead of a combined classification of die setters and press operators.

The press, machine and small parts shops were shut down by a walk out of the workers. Officers of the UAW-CIO denounced the shutdown as unauthorized and urged the men to go back. Controversy ended with a 5c. increase.

The union however made the tie-up the occasion for demanding again that the War Department take over Willow Run and operate it.

WAGE RISE BEATS COSTS

LANSING, MICH.—Weekly earnings of Michigan factory workers have increased twice as fast as weekly expenses since January, 1941, writes A. T. Court in *Michigan Labor and Industry*, October, 1943. Weekly pay increased 61 percent, while weekly living costs went up 25 percent in Detroit. Even on the basis of hourly earnings, which rose 37 percent, the workers' purchasing power rose strongly.

After tax deductions and 10 percent War Bond purchases, the worker's net disposable income of $43.00 in 1943 was $4.95 more than in early 1941, while living costs of $30.05 had gone up $4.38. In other words, the worker had more left after living costs in late 1943.

Leasing Surplus Equipment Speeds Production; Army Cuts Inventory

WASHINGTON — To bridge the gap between the hesitancy of many companies to buy large amounts of used equipment and the anxiety of federal agencies to put their surplus equipment to work, the government is reported to be making its surplus available for lease. This arrangement is expected to help quicken the flow of surplus equipment back into industrial channels. Meanwhile, the rate of liquidation of the $1,000,000,000 in federal surpluses is reported to be currently running at around $2,000,000 weekly, a rate which has been reached in successive weekly leaps of some 25 percent above previous totals. Indications are that the weekly total will continue increasing.

Army Using Surplus

A major relief to the whole surplus situation is the revelation by WPB spokesmen that the Army is successfully finding uses for its own surpluses before turning them over completely for general sale. As has been previously pointed out in AMERICAN MACHINIST, the army makes available its listings of surplus equipment to WPB's redistribution division, and during the next 20 days tries to find uses for it within the Army's own jurisdiction. If the Army can't use it in one of its own services at the end of 20 days, then WPB has 90 days in which to try to liquidate or lease it, after which the items may be turned back to the Army for scrapping or other disposal. Thus, since the Army is making use of a good portion of its own surpluses in its various branches, that means that considerably less than the widely reported $1,000,000,000 in Army surpluses may be offered for sale.

It is reported that in a recent listing of $85,000 of equipment, the Army managed to make use of $80,000 itself, and only turned over $5,000 in odds and ends out of the whole list. Reports are that the Army may be able to absorb some $60,000,000 of its own equipment during the first quarter of its liquidation effort. However, Army lists are including old "klunkers" and some special purpose equipment coming from the stripping of entire ordnance plants, and disposal of such items is highly doubtful.

WPB Okays Releases

Purchasers secure this used equipment through the facilities section of their regional WPB office. If the item is on the critical list, then its release must be okayed by WPB to the particular purchaser. If it is a non-critical item, the buyer is merely referred to the particular Federal agency having such equipment to sell, and purchase may be made without priority on these items. Moreover, dealers may handle negotiations for their customers in the purchase of Army equipment, but not on Treasury Procurement items.

Congressional Committee Set Up

Meanwhile, a Public Buildings and Grounds subcommittee set up in the House is studying ways and means of government disposal of surpluses and federal-owned property. The committee has criticized the Army and Navy as being slow to provide necessary data, and claims that various federal agencies are squabbling over control of surpluses.

Wartime Washington

Rising food prices spur higher wage demands. Wage boosts would influence future renegotiation. Baruch's new job may tie in with plans of Congress. Contract cancellation confusion continues. Truck component bottleneck serious

Labor Loses Its Patience

With Congress and the President having failed to hold down living costs due to inability to take political risks which would be involved in reducing farm prices, labor's patience was finally exhausted a few weeks ago, as the CIO and the railway unions pressed demands for higher wages. The existence of the "Little Steel" formula, limiting wage increases to 15 percent over the January, 1941, level, was bound to be short-lived. It was doubtful that a wrangling Congress could whip out in a hurry a "food subsidy" law which would give the farmers higher prices and the public lower food prices.

The immediate impact on industry, which will face higher wages, will be in some cases an urgent necessity of having the government review some of the "renegotiated contracts" in the light of higher labor costs. Although about 70 percent of all government contracts are fixed price agreements and will be affected by higher wages, directly or indirectly—steel prices may have to be raised if labor costs rise — some observers believe that industry's "post-renegotiation" profits will still permit the absorption of these higher costs, and that higher wages will merely come out of the government's pocket in the form of smaller taxes from corporations. However, this is probably a too easy manner of setting this issue aside, since it undoubtedly will badly disrupt operating costs for many war contractors.

Substantially offsetting the unfavorable impact on industry from new labor uncertainties, was the appointment of Bernard M. Baruch as head of a new unit handling war and postwar adjustment policies, including contract termination. The general reaction here is that Mr. Baruch will boil the confusion and delay down if given a fair chance to do so. It is pointed out that his handling of the rubber mess was a top-notch accomplishment, and that his manpower recommendations were very sound, too, but unfortunately his manpower program touched on sacred labor practices about which the War Manpower Commission is helpless.

See Displacement Of WPB

The appointment of Bernard Baruch as head of the War and Postwar Adjustment Unit by Stabilization Director Byrnes has practically eliminated War Production Board as a postwar factor. Indications also are that Mr. Baruch may move in on a number of policies now considered WPB functions.

Gradual lopping off of WPB activities and further removal of this agency from direct contact with the President has reduced its prestige materially. Recent failures of the Administration to go through with plans proposed by those close to the President for strengthening the hands of WPB executives, underscores the impression that this agency has passed its zenith of authority.

Baruch May Head Contract Agency

Since the Murray committee is recommending a strong central agency "under mandate of Congress" to settle war contracts, it is regarded as a good possibility that any such agency might very well be headed by Mr. Baruch to continue the work he is starting to do now. In its recommendation, the Senate Military Affairs Committee indicated a general dissatisfaction with the contract termination policies of the Army, Navy, Maritime Commission, and the War Production Board.

Unfortunately, confusion over the essential problems of contract termination persists in government circles. Attorney General Biddle in testimony before the Senate Military Affairs Subcommittee, proposed that the government make "reconversion loans" to industry so that "procurement agencies could proceed with greater care in making final settlements. Similar proposals, advanced by other government spokesmen, have been rejected by industry as making no allowance for the fact that war plants would be cluttered up with work-in-process, which would have to stay right where it was until contract termination settlements could be made. In other words, speedy settlements of terminated contracts and prompt availability of cash must both be included in any plans for aiding industry to reconvert at the end of the war.

Incentive Pay Gets Results

Plant-wide incentive-pay plans are taking hold very rapidly in a wide variety of war production plants. Two of the largest airplane manufacturers have submitted proposals as a basis of adoption of this method of swelling the pay envelopes of employees. Labor, seeing the results, is withdrawing its opposition.

Incentive pay has been credited directly with production increases ranging from 11 to 38 percent. No uniform basis of determining what employees may get for upping the man-hour output of an entire plant or a division of a plant has been found practical. Plants that already have a good production record usually get a better break than those in which use of employees and management has been wasteful. But each plant is a problem by itself.

Push Truck Components

Biggest War Production Board problem currently is that of trying to widen the many component bottlenecks which threaten to interfere with the Army's ambitious truck program for 1944. Exact details of the program have not been firmly settled, but the required number of extra-heavy trucks will run into the most component problems in axles, gears, transmissions, engines, and so on.

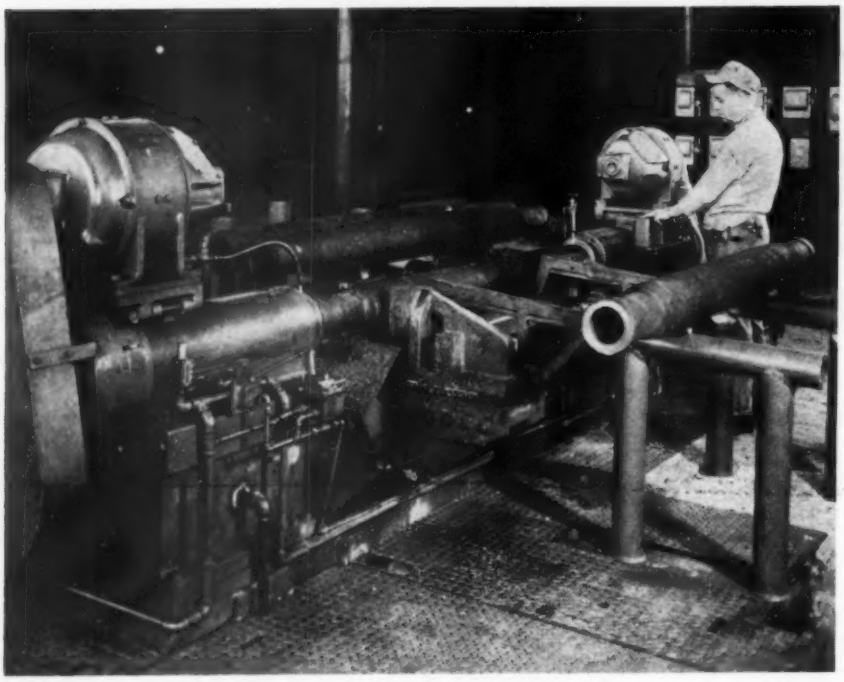
Some bottlenecks may be eased by bringing the machine tool industry into the picture. It is reported that the industry is already preparing to turn out bearings, and it may work on axles and crankshafts, too.

Would Cut Labor Hoarding

The government's action in trying to eliminate almost all of the cost-plus-fixed-fee contracts and replace them by fixed price agreements is expected to aid relieve manpower shortages in some critical areas where a large amount of labor "hoarding" has been reported by concerns with the cost-plus-fixed-fee arrangements. A more intensive reshuffling of war contracts, partly because of manpower and partly due to changed war production plans, will also help ease the labor bottleneck. The ambitious tire program for 1944, for example, will force some war business out of Akron tire plants so that they can get back to work on their normal product.

To De-Allocate Ferro Alloys

Within a week vanadium, molybdenum and cobalt, with the possible addition of tungsten, will cease to be allocated in view of the improvement in the positions of these ferro-alloys. This will save a lot of paper work for buyers and sellers of the alloys, since allocations will no longer be required on each single transaction. Instead, producers will



Steel Saver—Tubular steel railway axles, of whcih production has been started by Pittsburgh Steel Co., are machined to exact centers in the final operation. The producers state the use of these axles will not only save war-needed steel, but will lower railroad operating cost and increase safety. Raw material consists of seamless steel tubing, forged by the Pilger process

have to report monthly to the Ferro-Alloys Section of the Steel Division of WPB. Since the WPB controls melting schedules of alloy-steel producers, and PR-1 limits inventories to 60 days' supply, the removal of the ferro-alloys from allocation does not mean that over-all restrictions on their use have been withdrawn.

Meanwhile, the Steel Division continues to have difficulty in switching alloy steel orders from open-hearths to electric furnaces to assure that the new electric capacity will be utilized fully. For some six weeks, Copperweld Steel Co., Warren, Ohio, has been complaining that it had idle electric furnace capacity. But this was not the only company with sporadically idle furnaces, as alloy steel buyers hesitated to pay the $10 differential for electric furnace steel over open-hearth steel.

See Idleness for Electric Furnaces

Although WPB has asked the cooperation of the Claimant Agencies in keeping the electric furnaces busy, and ruled that 7 types of alloy steels must only be made in the electric furnaces and not in the open-hearth, many observers believe that more stringent action is necessary to head off enforced idleness of electric furnaces while open-hearths make alloy steel instead of badly needed carbon steel. It is possible that WPB may have to order some of the steel producers to stop using certain open-hearths for making alloy steel.

(**Components** . . . *continued from* 124c)

dustry may enter bearings production with the aid of specially installed equipment is regarded as an indicator that similar steps will be taken on other components. Machine tool companies could easily make crankshafts and machine axles, and piston rings, to mention a few items.

Problem is Deep-Seated

Nub of the component bottlenecks goes further back than the finishing plants, however. The forge shops and foundries are reported to be well below capacity due to manpower shortages. This problem is now being tackled by WPB. It will also tie in to some manpower shortages in finishing plants—one piston ring manufacturer is now only operating at 30 percent below capacity due to labor shortages, a transmission manufacturer is turning out 4,000 units monthly below capacity.

Although WPB would like to avoid getting into the scheduling of these components, observers believe that the solution to the problem lies in (1) screening requirements; (2) freezing production schedules; (3) "meshing" component scheduling so that all parts related to the truck program can be scheduled together, all parts for the small naval vessels program can be scheduled together, etc.; (4) trim down inventories in certain spots; and (5) get the required manpower where it is needed, which is easier said than done.

ASU and Industry Cooperate To Fight Allotment Waste

WRIGHT FIELD, OHIO — Over 100,000 tons of steel allotments; 22,000,000 lbs. of copper allotments and 85,000,000 lbs. of aluminum allotments for the fourth quarter were returned as unused to the Aircraft Scheduling Unit by the aircraft industry. These returns are roughly 20 percent of the gross amounts handed out to the industry, Col. E. W. Rawlings, newly appointed ASU administrator has announced.

The ASU is now conducting a campaign for the prompt return of unneeded first and second quarter 1944 allotments.

Metals Capacity Sufficient

Most encouraging aspect of the "attrition" problem is the improved materials situation. Sufficient capacity exists now to take care of all valid aircraft demands. Moreover, ASU policy is to hold allotment reserves large enough to permit immediate processing of necessary supplemental requests. Colonel Rawlings stated that these conditions should prevent allotment requests in excess of actual requirements and should limit the holding of unused allotments of any size.

Safety Council Announces Its Section Panel Officers

CHICAGO—Revised lists of the panels of officers elected by the various sections of the National Safety Council, have been released:

POWER PRESS SECTION: General chairman, G. H. Berry, Western Electric Co.; vice chairman, Louis Boraks, Liberty Mutual Insurance Co.

METALS SECTION: General chairman, J. P. O'Rourk, Bethlehem Steel Corp.; vice chairmen, Earl Fyler, Carnegie-Illinois Steel Corp., and Jacob L. Ridinger, Inland Steel Co.

AUTOMOTIVE AND MACHINE SHOP SECTION: General chairman, H. B. Duffus, Westinghouse Electric & Mfg. Co.; vice chairmen, O. F. Lehman, Chrysler Corp., and J. W. Young, International Harvester Co.; engineering committee, chairman, G. W. Kennedy, Buick Motor Div., P. V. Bailey, Remington Rand, Inc., and F. P. Dedrick, The Bullard Co.

ENGINEERING SECTION: General chairman, H. R. Bixler, Mutual Life Insurance Co., vice chairmen, W. R. Smith, Public Service Electric & Gas Co., and W. Dean Keefer, Lumbermen's Mutual Casualty Co.

AIRCRAFT MANUFACTURING SECTION: General chairman, R. B. Carter, Consolidated Vultee Aircraft Corp.; engineering committee, chairman, Raymond L. Woods, Fisher-Memphis Aircraft Div., and C. G. Bender, Bell Aircraft Corp.

Spotting The Air News

See manpower as a chronic problem. Other industries charge labor hoarding. Ten-grand monthly plane rate foreseen. Plane and engine makers produce enough for years to come. Army tells of B-29. Seek funds for helicopter study

Third and last major problem of aircraft production — manpower, never will be completely whipped. (Number one was machine tools, second materials; both done up and all but forgotten.) Donald Nelson says one main reason for 10 percent gain in October was increased efficiency in use of manpower (the other was standardization of models and less design changes.) Though West Coast producers can and do demonstrate with figures that their output has increased 4260 percent with only 933 percent build-up of personnel, not everybody agrees with them.

Aircraft community leaders say plane plant help is loafing while their non-aviation industries get canceled contracts. They have brought pressure on Congress, and, as a result, WPB and the Manpower Commission denied North American Aviation at Dallas 10,000 additional workers being sought. The Truman Committee has many complaints and is watching other plants. But James F. Byrnes, director of Office of War Mobilization, did get Selective Service to grant deferment for six months to irreplaceable aircraft workers, with provision for renewal. Two Northrop and two North American plants are on two 10-hour shifts instead of three 8's. They are also trying incentive pay plans—which nobody likes. The Northrop-NAA program is a guinea pig operation which government and industry are watching. Unions on the Coast are considering asking for a basic increase in wages from 60c to 80c as manpower turnover remedy.

Ten percent gain in aircraft production in October leads some observers to bet on attainment of the 10,000-per-month objective rate by newyear. Others think the industry can barely top a rate of 9,000. Future cutbacks in other weapons and supplies will increasingly divert skilled workers to aircraft, with good effect. Growing proportion of heavy bombers will more than ever hold back the numerical output figure, but the President's suggestion that tons, not units, be reported for accuracy, still is ignored.

Surplus warplanes problem generates much talk and no solution. All combat craft, except those needed for postwar air forces and any world police force that may be created, will be junk. But transport planes, being produced at the rate of 10,000 a year, will be usable as is for cargo and passengers after conversion. There'll be enough to equip all world airlines for several years without turning a factory wheel—even parts will be in stock. A bill in Congress authorizing Civil Aeronautics Board to handle liquidation of warplanes is widely disapproved. All industries will want their own liquidation agencies, but probably across-the-board authority will handle not only surplus equipment but plants, termination of contracts, manpower and demobilization.

Experts may argue over the postwar value of converted transport planes as compared with new designs (which will not be ready for two to five years) but there is no debate about aviation engines and propellers. Between a quarter and a half million engines will be on hand at peace time. Deducting those the military will want to keep, and the liquid-cooled Allisons and Rolls Merlins, whose use in commercial planes would be feasible, but unconventional in this country, there will be enough air-cooled engines, in suitable power sizes, to stock the world for years to come. They will need no conversion to speak of. The same story, numbers and all, with negligible reservations, fits propellers.

Boeing's B-29 had become almost a household word when the Army coyly made it public the other day. It was the Army's worst-kept secret. Aircraft circles had talked it freely for two or three years. The lid is still tight on details, will be till the enemy gets one. This bomber is about twice as big as the B-17 Fortress, a little smaller than the famous B-19, only one of which was built—by Douglas. The B-29 could attack across the Atlantic and come home, non-stop, but its load would be mostly fuel, few bombs. It can hit hard at any point in Hitler's Europe, from present bases. It will hit the Japs, and soon. Production of the B-17s and B-24s will increase. There were plans for a super-heavy Consolidated bomber too, but it was dropped, because the Army wants to concentrate on fewer models.

God save the helicopter from its friends. So say the experts. They fear that press and public are touting it to the same fate that overtook the gyro. This machine is being flown successfully, but its design is still cut-and-try. No one knows how to figure stresses on its rotor blades, or how the air moves around them. Until the direct-lift formula is known, larger bus types cannot be built for sale. The National

Porcupine Punch—The 388 quills of the Boeing Aircraft Co.-designed die are turning out bomb bay walkway parts for the flying fortress thirty times faster than the previous method of drilling. Accuracy is held to 0.0005 in.

Advisory Committee for Aeronautics has asked Congress for just over one million dollars to build a laboratory at Langley Field, Va., to work out helicopter aerodynamics. The lab also will study flutter, vibration, and compressibility of air, phenomena which occur in all air foils and still are not completely understood.

Kaiser and Hughes are rolling ahead with construction of their huge wooden flying boats on the West Coast. First one of the three is scheduled to fly in 1944. This machine is designed to carry 750 troops, or to evacuate 500 wounded. The Army, which gave Kaiser the contract upon insistence of the President, would now like to stop the project, which is burning up a lot of manpower. There is small hope the planes will be in production for the war. But everybody is curious to see what will turn out.

Predominant Agency Will Renegotiate Whole Industry

WASHINGTON — Renegotiation of war contracts is gradually being shifted to an industry basis from the previous predominance of dollar value of contracts with each contractor. This means that in the very near future, the particular federal agency holding the bulk of contracts covering an industry, will renegotiate all war contracts for that particular industry for all the other federal agencies. Up to a few weeks ago, all renegotiation was being carried on by the federal agency with the bulk of the dollar value of outstanding war contracts for each contractor.

See Completion by Year-End

Through mid-November, 1943, over 10,000 war contractors had been renegotiated by the government, and federal officials believe that by the year-end practically all of the remaining 12,500 contractors will have been renegotiated on their 1942 calendar or fiscal year operations. Since federal price adjustment boards were not adequately manned until March, 1943, and have since acquired considerable experience, it is believed that 1943 operations of war contractors will be renegotiated much more speedily than 1942 results.

Of the renegotiated contractors, about 40 percent did not have to return any profits to the government as being "excessive." Renegotiation officials say that the sequence of their activities is (1) the largest companies; (2) those involved in potentially scandalous rumors or reports; (3) those requesting voluntary renegotiation to get it over with, and (4) all other companies. It is emphasized that in determining the contractors' "fair margin" of profit all of these factors are taken into consideration: (1) price reduction and comparative prices; (2) efficiency in reducing costs; (3) economy in the use of raw materials; (4) efficiency in use of facilities and conservation of manpower; (5) character and extent of subconstracting; (6) quality of production; (7) complexity of manufacturing technique; (8) rate of delivery and turnover; (9) inventive and developmental contribution; (10) cooperation in supplying technical assistance to other sources of supply and the effect of this on the contractor's postwar business. Other vital factors are also considered, such as impending wage increases, probable changes in material costs, etc.

Appeal Is Possible

If a contractor has been renegotiated by his regional price adjustment section and he is dissatisfied, he may appeal to the War Department's price adjustment board in Washington (or similar boards set up by other federal agencies), and then a final appeal may be made to the Under-Secretary of War. It is pointed out that very few mandatory unilateral rulings have had to be issued against war contractors, and that about 90 percent of them have generally been satisfied.

BUSINESS ITEMS

Cooper-Bessemer Corp. has opened a third West Coast branch at 401 Rust Bldg., San Francisco, under the local supervision of John G. McKissick.

Manufacturers' Equipment Co., Chicago, has been acquired by Harry I. Schuster. He is a pioneer in the air operated chucks and collapsible tap field. The firm, now at W. Lake St., will move into the factory building at 3025 W. Atkinson Ave. in about two months. Mr. Schuster becomes president of the company and B. A. Schuster, vice president.

Herman Yaras, head of a Los Angeles importing and exporting company, will open new trade channels in Mexico on the completion of trade arrangements with the firm Mexargo in Mexico City. Until recently Mr. Yaras was president of the Marsman Trading Corp. in the Philippines and one of the last civilians to leave the islands before the Japs moved in.

Turco Products, Inc. has established an organic research laboratory in its Los Angeles plant, with Dr. Nathaniel Baum head of the new department. Dr. Baum has been consulting chemist in Chicago in organic synthesis and resins for the past 6 years.

Tube Turns of Louisville, Ky., has established two new West Coast offices. One is located at 2611-12 Russ Bldg., San Francisco, with T. H. Pike, Jr. named district manager. John M. Hartley, formerly of the Los Angeles office, will handle the territory including Washington, Oregon and British Columbia from an office maintained in the Smith Tower Bldg., Seattle. The Los Angeles office has been discontinued.

NAMES in the NEWS

William R. Moore

William R. Moore has been appointed a vice president of Norton Co., Worcester, Mass., and will handle ore and grain sales to grinding wheel and abrasive paper and cloth manufacturers. He will also have charge of sales of refractories, boron carbide and pulpstones. He has been active in the sales division of the company for a number of years, becoming general sales manager of the abrasive division in 1939.

Herbert H. Leonard has resigned from his position as president and treasurer of the Consolidated Packaging Machinery Co. of Buffalo to become president of American Machine & Foundry Co., Brooklyn, N. Y. Mr. Leonard has been a member of the board of directors and engineering consultant to American Machine & Foundry. Morehead Patterson, formerly president of the company and associated with the firm for many years, becomes chairman of the board.

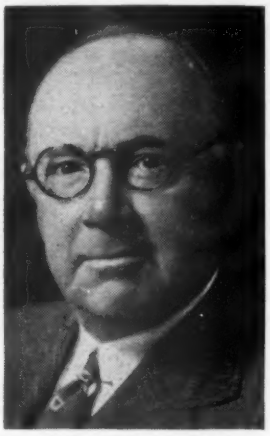
Francis J. Curtis was recently named a vice president of Monsanto Chemical Co. In his new capacity Mr. Curtis will be in charge of the company's long range program of development here and abroad, including general research and sales development.

Blackstone

Floyd Rose

Floyd Rose, formerly vice president of Vanadium-Alloys Steel Co., Latrobe, Pa., tool steel manufacturers, was advanced to president at a recent meeting of the board of directors. Roy C. McKenna, who was previously president of Vanadium-Alloys, was elected chairman of the board. James P. Gill has been named vice president of the organization.

Promoted to Chairman and President of Niles-Bement-Pond



CLAYTON R. BURT

CHAS. W. DEEDS

Clayton R. Burt has been promoted to the chairman of the board of the Niles-Bement-Pond Co. He will continue to spend full time in active guidance of the W. Hartford plant, which he has headed since 1924. Charles W. Deeds has been elected president and general manager, succeeding Clayton R. Burt. Mr. Deeds was formerly vice president and general manager of the Pratt & Whitney Aircraft Div. of United Aircraft Corp. in E. Hartford. In 1938 he joined Chandler-Evans Corp. as president. This company was recently acquired by Niles-Bement-Pond.

Don S. Connor has been appointed director of field engineering of Micromatic Hone Corp., Detroit. Mr. Connor has been connected with the company since 1933, and for the past few years he has represented the firm in the eastern territory with headquarters in New Haven, Conn.

H. G. Mackenzie has become manager of the Pacific Northwest division of E. C. Atkins & Co., Indianapolis. He will make his headquarters at the company's Portland, Ore., office. For a long time Mr. Mackenzie operated his own company as a manufacturer of saws and machine knives.

W. H. Maxwell has been made general sales manager of Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co., Detroit. Since 1932 he has been in charge of Wolverine's eastern sales office at New York City.

Henry T. Moore, eastern zone manager for Briggs Clarifier Co., Washington, D. C., has been advanced to general sales manager. E. K. Burgess and J. H. Nash have been appointed assistant sales managers for the newly formed automotive and industrial divisions respectively.

Clem H. Franks has been named president of the Teletype Corp., Chicago, a subsidiary of Western Electric Co. He succeeds Gustave Heding who has resigned because of ill health. Mr. Franks was elected vice president of Teletype in April of this year after having been associated with Western Electric since 1923.

Clyde Llewelyn has been advanced from assistant to the president of Bliss & Laughlin, Inc., Harvey, Ill., to vice president in charge of operations. J. Stanley McCord has been appointed sales manager of the eastern division with headquarters in Buffalo; while John O. Hoover succeeds him as district manager in Philadelphia.

K. C. Gardner

K. C. Gardner, formerly executive vice president and general manager of United Engineering & Foundry Co., Pittsburgh, has been advanced to president and general manager to succeed the late George T. Ladd. Mr. Gardner has been connected with United Engineering since 1901. At the same time it has been announced that John L. Young, formerly manager of machinery sales, has been made vice president in charge of industrial research.

Joseph P. McGough has been named manager of the Cleveland plant of Jos. T. Ryerson & Son, succeeding Fred Doran, who was transferred to Chicago some time ago as vice president of the company.

R. H. Rodolph has been appointed manager of the pump and compressor division of Gardner-Denver Co., Quincy, Ill.

R. F. Pearson has become eastern district manager of sales of Granite City Steel Co., Granite City, Ill. He succeeds Charles R. Wallander, Jr., who has joined the armed forces.

Stephen B. Mambert, formerly an executive of the Kingsbury Ordnance Plant, LaPorte, Ind., has become assistant to Alfred Marchev, president of Republic Aviation Corp. Prior to his connection with Kingsbury, Mr. Mambert was associated with the Vacuum Oil Co.

Theodore J. Kauffeld has been made vice president and general manager of Burchell Products, New York City. At the same time he was elected a director of the company.

Victor F. J. Tlach has resigned as president of Darwin & Milner, Cleveland and has joined Actarc, Inc., welding electrode makers of that city, as vice president.

Jos. R. Terbell

Joseph B. Terbell has been advanced from vice president of the American Manganese Steel Div. to first vice president of American Brake Shoe Co., New York, N. Y. He joined the steel division in 1928, and after an apprenticeship of about two years in the Chicago Heights plant, Mr. Terbell entered the Chicago sales office. During 1931 he was transferred to the Ramapo-Ajax Div.; but the following year he was transferred back to the New York office of the American Manganese Steel Div. In 1933 he moved to St. Louis; then after a brief period in the Chicago sales department and in the American Forge Div., Mr. Terbell became eastern sales manager located in the New York office.

J. M. Johns has become general manager of industrial sales of Libby-Owens-Ford Glass Co., Toledo. Formerly Mr. Johns held the position as assistant to the vice president in charge of sales.

W. F. Newbery has been appointed sales manager of the Industrial Div. of Detrex Corp., Detroit. Mr. Newbery started with Detrex in 1934 and has recently served as south central region manager with headquarters at Dayton.

E. N. Calhoun was named president of Edwin L. Wiegand Co., Pittsburgh, at a recent meeting of the board of directors. He joined the organization in 1922 as a salesman and has held the offices of treasurer and general sales manager. Edwin L. Wiegand, who founded the company 28 years ago, becomes chairman of the board; while A. P. Wiegand has been elected senior vice president in charge of manufacturing.

E. N. Calhoun

David A. Nelson

David A. Nelson has joined Detroit Broach Co., Detroit, as vice president of the organization, at the same time becoming general manager of the West Coast plant in Beverly Hills, Calif. Mr. Nelson, who is well known in the broaching industry, was formerly secretary-treasurer of the Colonial Broach Co., with which concern he had been associated for the past 18 years.

Charles H. Weaver, formerly manager of the marine section of the industrial department of Westinghouse Electric & Mfg. Co., E. Pittsburgh, has become manager of the newly formed marine department. Mr. Weaver joined Westinghouse as a member of its student course in 1936. Two years later he was placed in the sales department of the generator division, remaining there until 1940 when he became associated with the marine section.

Chas. H. Weaver

John C. Graf has been named sales manager of the hydraulic press and special equipment department of Baldwin Southwark Div., Baldwin Locomotive Wks., Philadelphia. Mr. Graf entered the employ of Southwark Foundry & Machine Co., now Baldwin Southwark Div., 1915. Since 1925 he has been New England sales manager of the firm.

John C. Buchanan has been named plant manager of the Muskegon Heights plant of Norge Div., Borg-Warner Corp., Chicago. Previously Mr. Buchanan was assistant plant manager of this division.

OBITUARIES

David Beecroft, 68, a pioneer in the automobile industry and a former president of the Society of Automotive Engineers died in South Bend, Ind., following an illness of several months. Mr. Beecroft had been associated with Bendix Aviation Corp. for 15 years in various executive capacities. He had lectured widely on automotive topics and had written for technical and popular publications.

David Beecroft

George L. L. Davis, 67, vice president in charge of sales of Scullin Steel Co., St. Louis, was accidentally killed while on a tour of inspection of the company's plant.

Thomas E. Kilby, 78, president of Kilby Steel Co., Anniston, Ala., and a former governor of Alabama, passed away at his home.

Samuel S. Hargraves, vice president and manager of the machining division of Melling Forging Co. died recently at his home.

Matthew D. Willard, 76, founder of Willard Machine Co., Buffalo, and originator of the Auburn bicycle, died in Brockville, Ont., after a long illness.

E. C. Biewend, vice president and general manager of Decker Screw Products Co., Albion, Mich., died at his home recently of a heart attack.

Charles Wescott Gennet, Jr., 67, vice president of Sperry Rail Service, a division of Sperry Products, Inc., Hoboken, N. J., died of a heart attack at his home in Chicago. He had served as vice president for the past 15 years.

James Dickinson Rhodes, former president of National Car Wheel Co., now Southern Wheel Div., American Brake Shoe Co., New York City, passed away in Utica, N. Y., at the age of 74. Mr. Rhodes had been chairman of the board of Castalia Portland Cement Co., director of American Window Glass Co. and of Blaw-Knox Co., Pittsburgh.

Robert Reid, 71, co-founder of Reid Brothers, Beverly, Mass.; died at his home after a long illness. He and his brother Andrew F. organized the company 44 years ago.

Rowland Campbell, 48, recently passed away. He was former president and chairman of the board of the old Reo Motor Car Co., and president of Campbell Engineering Co., Appleton, Wis.

Harold C. Urschel, 72, who recently completed an invention on a revolutionary type railroad axle, died of a heart attack at his home in Toledo. He was a member of the Urschel Engineering Co.

F. Joseph Lamb, president of Lamb Mfg. Co., Detroit, and a veteran of the tool and die business in that city, died recently.

Frank Nickerson, manager of sales in the San Francisco district for Bethlehem Steel Co., passed away. Previous to joining Bethlehem in 1922, Mr. Nickerson was connected with Midvale Steel & Ordnance Co. in San Francisco.

Paul F. Klieber, 55, founder of Klieber-Dawson Machine Co., Indianapolis, owner and chief engineer of Klieber Engineering Co., died recently.

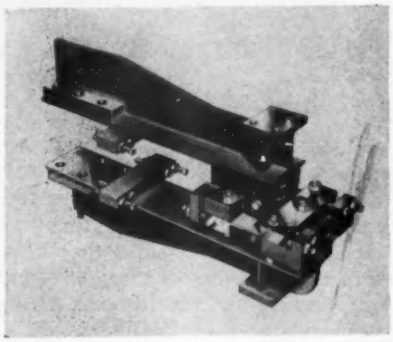
MEETINGS

American Society of Mechanical Engineers. Annual meeting. Hotel Pennsylvania, New York, N. Y. Nov. 29-Dec. 3.

Exposition of Chemical Industries. Madison Square Garden, New York, N. Y. Dec. 6-11.

Society of Automotive Engineers. Annual meeting. Book-Cadillac Hotel. Detroit, Mich. Jan. 10-14.

Shop Equipment News



Leslie Self-Balancing Die Set Increases Press Brake Range

Leslie Welding Co., 2943 Carroll Ave., Chicago, Ill., is making a self-balancing die set which features a link pivot to absorb stresses that would cause excess strains in the leaf springs. This die set is designed to increase the range of work that can be done on press brakes, and permits work of almost unlimited length and width, and is said to give accurate die alignment without the need for leader pins, "heels" or other aligning devices.

The punch holder and die shoe are held in alignment by lever arms, which in turn are attached to the opposite ends of a broad aligning leaf. In the operation of the die set, the leaf flexes, serving as a moving pivot between the upper and lower arms, returning the punches to exact positions for registration with the dies.

The self-balancing feature permits the die set to be used for stamping balanced as well as unbalanced work extending well in front or behind the ram without exerting horizontal forces on the ram of the brake. It is possible to leave the die set in the press brake when dies are changed because the heads of the screws holding the punch plates and dies are on the outer surfaces, thus providing easy access for the wrench. The dowel pins may also be knocked out as ample room has been allowed for the use of a drift and hammer.

With this set positive alignment of punches and dies is possible without leader pins. It is also said to permit any press brake to do the work of a straight side press.

Armstrong-Blum Develops Hydraulic Hacksaw for Billets and Forgings Which Has 24x24 in. Capacity

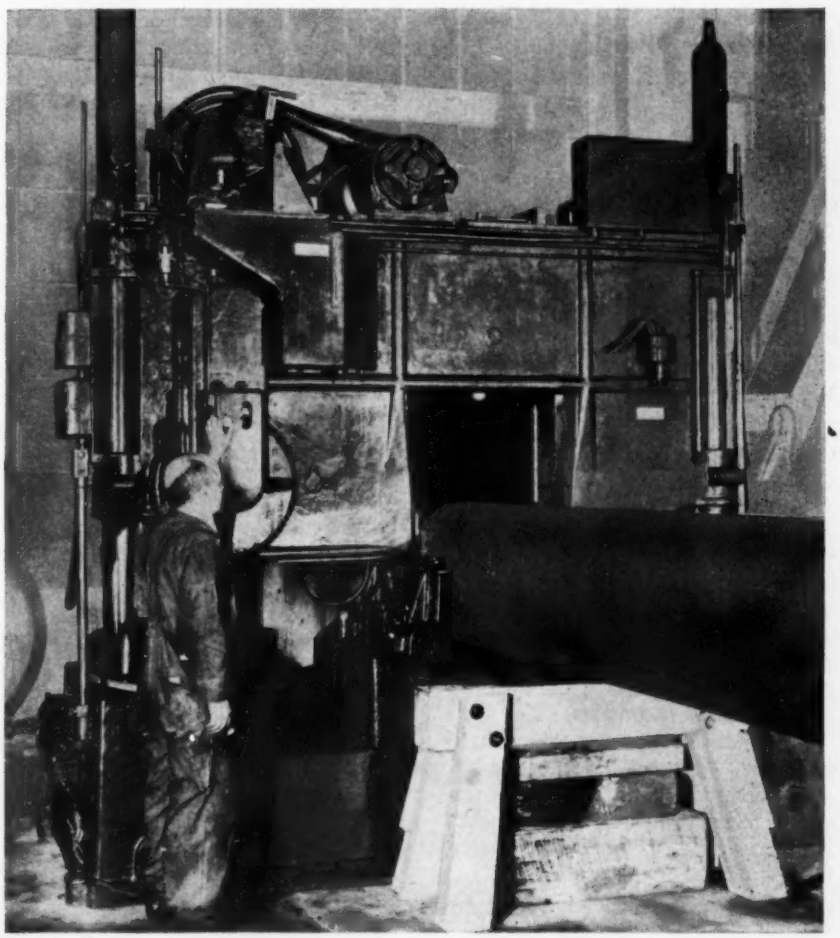
The No. 24 Marvel universal hydraulic roll-stroke hacksaw machine, recently produced by the Armstrong-Blum Manufacturing Co., 5700 West Bloomingdale Ave., Chicago 39, Ill., is believed to have the largest capacity of any hack sawing machine ever manufactured. Its design, operating principle and cutting action is similar to the No. 18 Marvel.

Having a nominal capacity of 24×24 in. and a maximum capacity of 25×26 in., the machine was developed to cut off or trim large billets, blocks and forgings by the hacksaw method. It employs low pressure feed and a roll-stroke cutting action. All moving parts are enclosed and protected against dust and dirt.

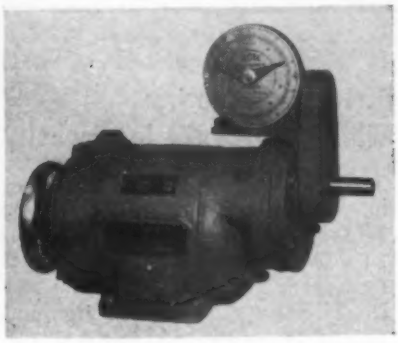
A special blade 36 in. long, 4½ in. wide and ⅛ in. thick and having 2½ teeth per in. is used on the No. 24. The blade has high speed steel teeth and an alloy body. The machine is 56×122×151 in. high and weighs 16,000 lb.

Globe A.C. Coil Winder Made In Bench or Pedestal Type

A No. 1 back geared a.c. coil winder has been made available by Globe Tool & Engineering Co., 436 Davis Ave., Dayton, Ohio. Wire in sizes from No. 16 to No. 42 may be wound into coils up to 5 or 6 in. in diameter and 4 in. long. The number



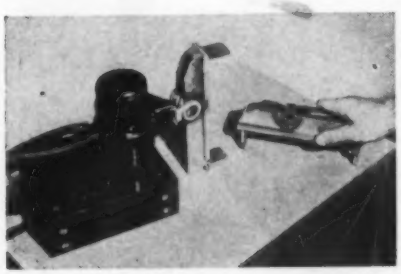
of turns accumulated is indicated on a counter. The winder can be furnished either as a bench or pedestal model, and in any back gear ratio from 2:1 to 18:1. The winding torque increases with the ratio of the



back gear, while the top speed decreases by the same ratio.

A floor mounted foot pedal controls the operation of the winder. Slight pressure releases the brake, freeing the spindle. Further pressure closes a mercury switch and starts the motor at a speed of about 10 r.p.m. Increased pedal depression increases the speed to a maximum of 2,000 r.p.m. in the 2:1 unit.

Ajax Induction Heating Coil Hardens Parts in Few Seconds



A focus inductor coil has been designed by Ajax Electrothermic Corp., Ajax Park, Trenton 5, N. J., to concentrate heat in small areas on both walls of metal parts for hardening by induction heat in a few seconds. This inductor coil is water-cooled, and heats in 35 sec. at a frequency of 35,000 cycles per sec. Power source is the standard Ajax-Northrup 6 kw. spark gap converter.

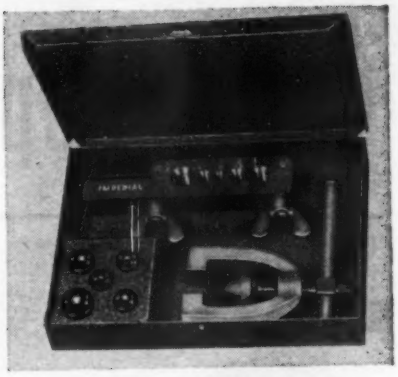
The inductor has a modified helical shape and is made to fit the standard primary of the Ajax focus inductor assembly. The heating inductor holding jig can be easily replaced for any special job.

The area of maximum heat is accurately concentrated at the surface to be hardened.

Imperial Double Flaring Tool For Thin Wall Steel Tubing

Imperial Brass Manufacturing Co., 1200 West Harrison St., Chicago 7, Ill., has developed the No. 93-FB multi-size double flaring tool. It will make double flares on all popular sizes of thin wall steel tubing from 3/16 to ½ in. for S.A.E. flare and inverted flare joints. The tool may also be used for making single or double flares on copper or aluminum tubing. The complete tool consists of a flaring bar, yoke and five adapters furnished in a metal kit.

A vise and hammering are unnecessary, and the flaring can be done in close quarters. The tool first bells the tubing, using an adapter, then completes the double flare in a way similar to a conventional flaring tool. It can be used with soft steel tubing of seamless, butt welded or lap seam



welded construction with wall not over 0.035 in. When used in close quarters, the rod handle of the tool can be removed from the yoke and a ratchet wrench applied to the ¼ in. square on the head of the cone screw.

Complete tool consists of a flaring bar, yoke and five adapters.

Reed-Prentice Adds Two Large Units to Its Line of Plastic Injection Molding Machines

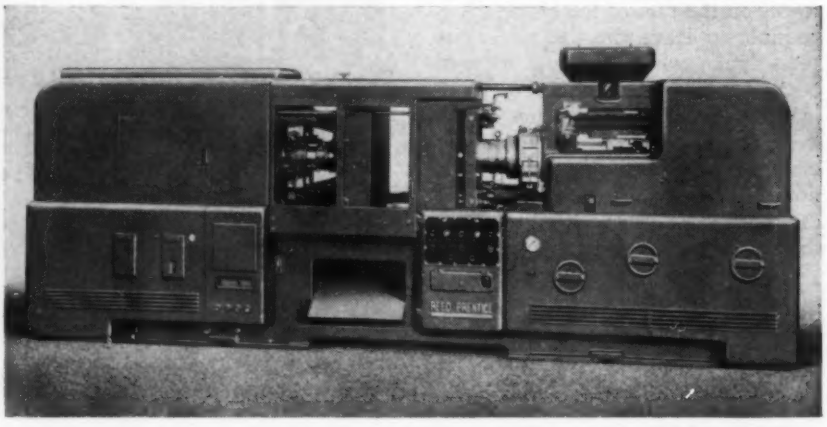
Reed-Prentice Corp., Worcester, Mass., has added two large plastic injection molding machines to its line. Identified as the 10-F, the machines are available in 16- and 22-oz. per shot sizes. Both sizes have the same construction features and the same overall dimensions, 210×54×79 in. high. Each handles die plates 30×30 in.

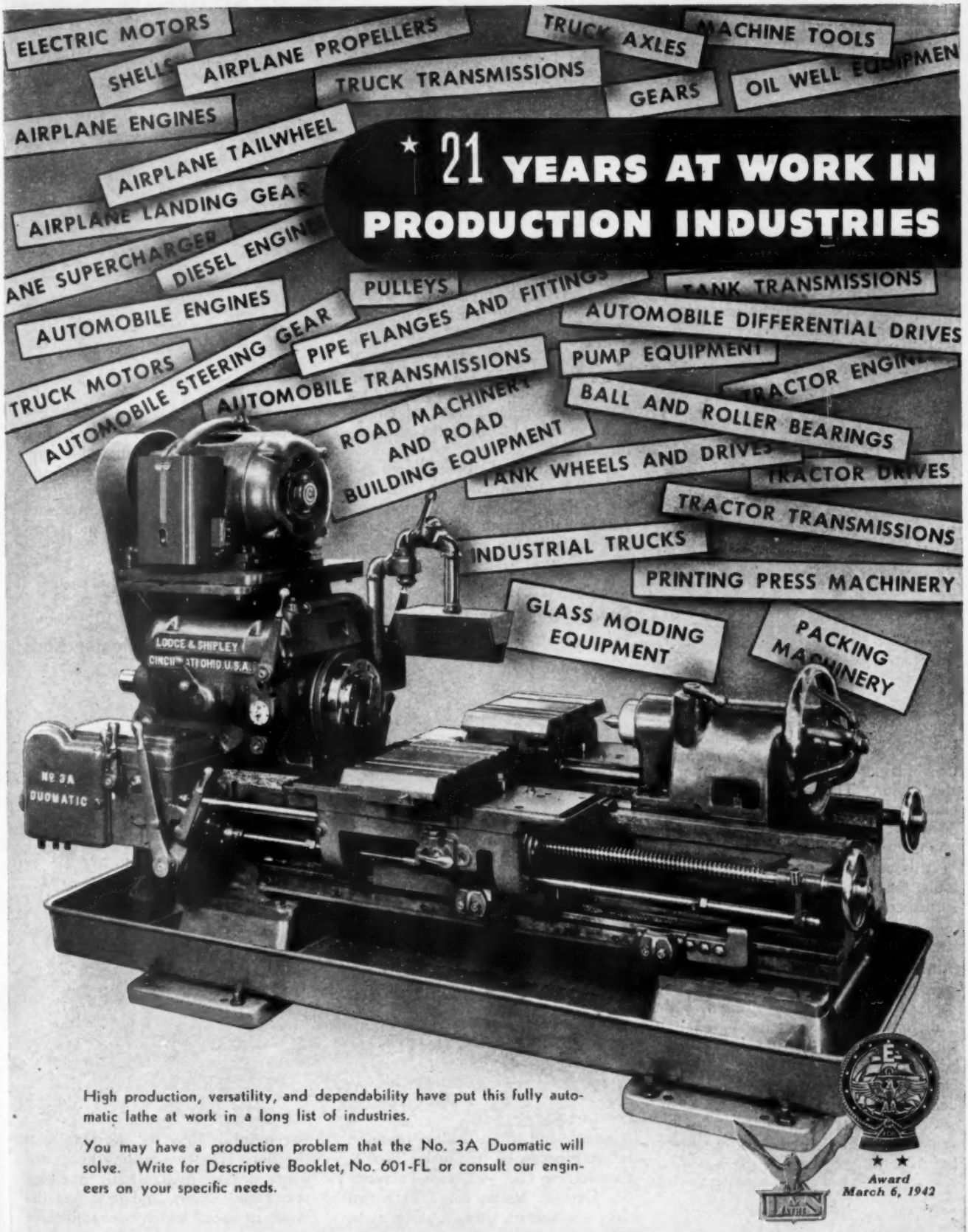
Mold locking mechanism provides 600-ton clamping pressure and 16-in. movement independent of die thickness. Die plates slide on hardened and ground steel ways and all moving parts are automatically lubricated. Push buttons control mold adjustment which is obtained by moving link mechanism within the frame by two large diameter motor-driven screws.

Frame construction uses heavy steel plates for stressed members. All piping, electrical controls and hydraulic equipment, except pumps, are mounted outside the base of the machine for accessibility.

Other features include: automatic ejection of die plate at the center and the four corners; safety doors with both hydraulic and electric interlocks and a new timing panel which automatically controls movement of die plate and plunger. Manual operation is instantly obtainable at any time and the die plate and plunger can be stopped at any position. Opening of the safety doors at any time also stops the die movement.

The 16-oz. machine, which can mold up to 22 cu. in. per shot, allows a maximum of 180 shots per hour and provides 27,000 psi. pressure on the material. Time required for injection stroke is 1.6 sec. On the 22 oz. machine, 29 cu. in. can be molded each shot, with a maximum of 150 shots an hour. Pressure on





High production, versatility, and dependability have put this fully automatic lathe at work in a long list of industries.

You may have a production problem that the No. 3A Duomatic will solve. Write for Descriptive Booklet, No. 601-FL or consult our engineers on your specific needs.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

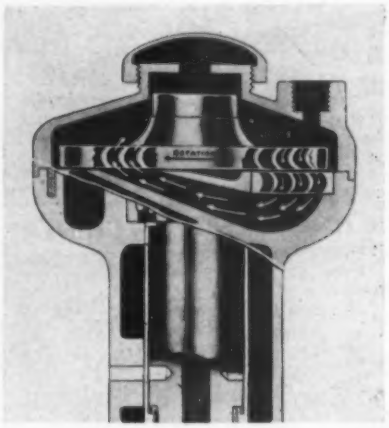
ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

material is 28,000 psi. and time required for injection stroke is 2.4 sec.

The 16-oz. machine weighs 14 tons and the larger machine is one-half ton heavier.

Onsrud Air Turbine Motors Has a Solid Milled Rotor

A solid milled rotor is being provided by Onsrud Machine Works, 3910 Palmer St., Chicago, Ill., in its air turbine motor. Operating on an impulse reaction principle, this rotor with bucket type impeller blades, employs an air feed-back system. It is said that the expanding air plus Ousrud Metered Mist lubrication, hold



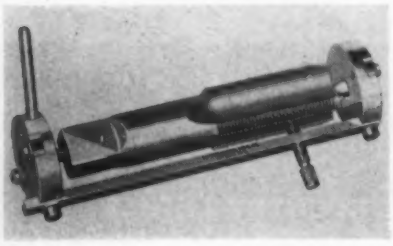
unavoidable wear to a minimum in the motor. The complete line includes motors ranging from 1/6 to 3 hp. operating at speeds of from 15,000 to 100,000 r.p.m.

Although developed for Onsrud tools, the new turbine motor can be furnished for other uses.

Minn-Kota Tap Grinding Tool Regrinds Worn or Dull Taps

Dull or worn taps can be reground with the tap grinding tool developed by Minn-Kota Manufacturing Co., Fargo, N. Dakota. It will grind any degree of chamfer and relief.

Center points of the lathe or tool grinder are centered on an adjustable bar in a slot provided on the outside



of each end of the tap grinding tool. The points are marked for adjustment by 1/64 in., and when set off center as desired, the inside center points holding the tap give it the right eccentric swing for grinding each flute. The tap is rotated and the setscrew tightened.

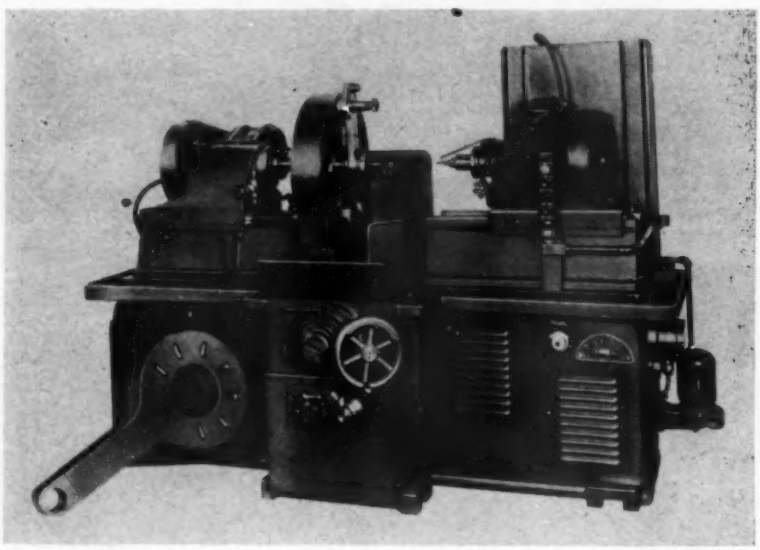
Diehl-Lite Adjustable Unit Has Blue-Tinted Lens

For inspection, assembly and sorting operations and precision machine jobs, Diehl Manufacturing Co., Electrical Div. of Singer Manufacturing Co., Somerville, N. J., has produced the Diehl-Lite supplemental lighting fixture. The unit is equipped with a 6-8 volt lamp, and standard equipment includes 110 or 220 volt transformer.

This lighting fixture is provided with a blue-tinted lens that gives nonglare daylight beam illumination. Additional clear or ruby red lenses are available for special uses. The

unit is housed in a Bakelite casing and mounted on an adjustable supporting arm with three ball and socket joints. The wiring is oil resistant and has a 12-in. lead with 3-in. between the fixture and transformer.

Snyder Develops Double-End Spline Miller For Cutting Slots in Aircraft Master Rods



A double-end spline milling machine is being produced by Snyder Tool & Engineering Co., 3400 East Lafayette St., Detroit, Mich., for cutting two slots at a time on aircraft master rods. One slot is milled on each side of the rod. Each slot measures $1\frac{1}{8} \times 7/16 \times \frac{7}{8}$ in.

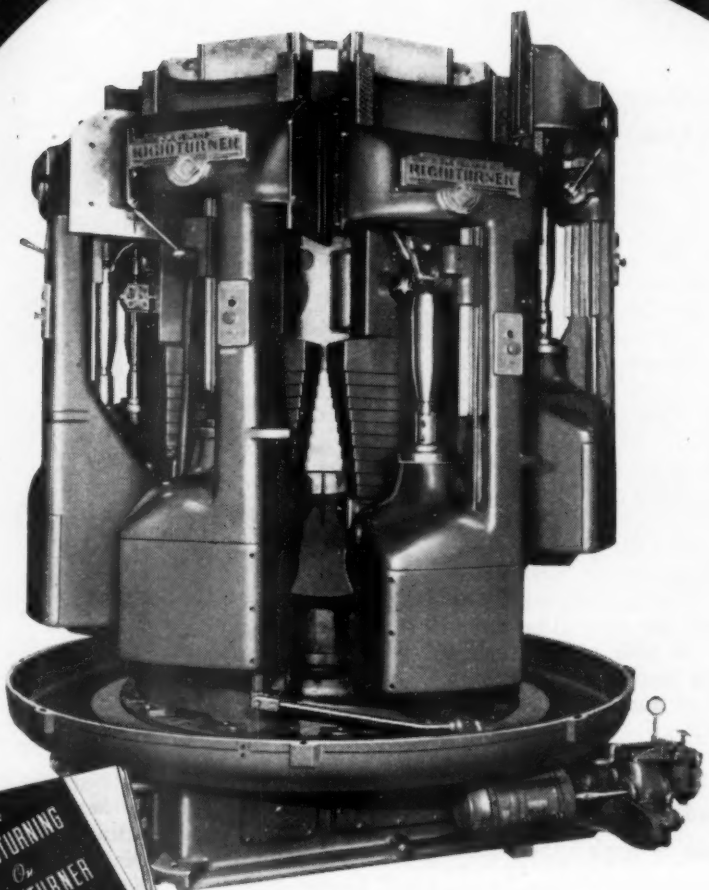
The part is loaded and clamped on a manually operated indexing fixture having seven indexes. The fixture assembly is mounted on an adjustable, reciprocating table which moves between solid stops for the length of the slots. The two milling heads advance against hydraulically operated speed stop screws, and feed into the work by steps which are adjustable from 0.005 to 0.060 in. per infeed stroke. The transverse table movement is adjustable for feed travel of $\frac{1}{2}$ to 10 in. per min. Production rate is approximately three rods an hour.

For set-up and try-out purposes, provision has been made to control

FOR TURNING MULTIPLE DIAMETERS

Quickly
Accurately
in Quantity

THE ROTARY RIGIDTURNER



Write for this bulletin which describes in detail what the Rigidturner can do—how it operates—and how it will cut your costs for multiple diameter turning.

● Today with high production of utmost importance, the Rotary Rigidturner is solving the turning of multiple diameters on precision work of all kinds—and shell up to 105 mm.

Here's a machine of exceptionally rigid construction adaptable to any type of shaft turning. It provides ease of operation—reduction in down time—minimum of changeover time—precise duplication—more operating minutes per hour and increased production at lower costs.

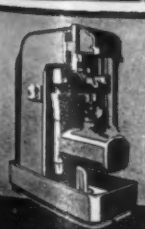
SIMPLE OPERATION

Eight spindles operate at one time—the operator merely inserts piece at loading position and presses button—all machining operations are automatic—does not require specially trained help.

FOR TURNING SHELL UP TO 105 MM.

A specially designed head and carbide tool is used for shell turning. The head is operated from a cam which has the shape of the shell to be turned. Duplication is positive and accurate.

The Rigidturner is also built in single spindle type and is particularly suited to turning multiple diameters quickly, economically on both short and long runs.



The CLEVELAND HOBBING
Cleveland ... MACHINE Company ... Ohio

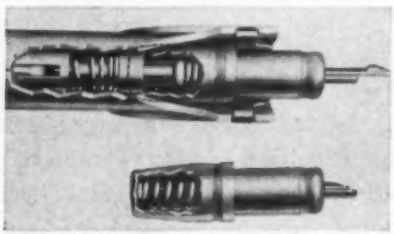
BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

the infeed manually. Both manual and automatic infeed per stroke are indicated on the calibrated dial on the front of the machine beside the handwheel. Hydraulic equipment as well as the coolant container are housed separately in the rear of the machine.

Prestole Skin Fastener Includes Safety Features

Two safety developments have been introduced in the airplane skin fastener made by Detroit Harvester Co., Prestole Div., Toledo, Ohio. A cap has been added to the conventional fastener to prevent retrograde movement of the spring and fastening element in the event of failure.

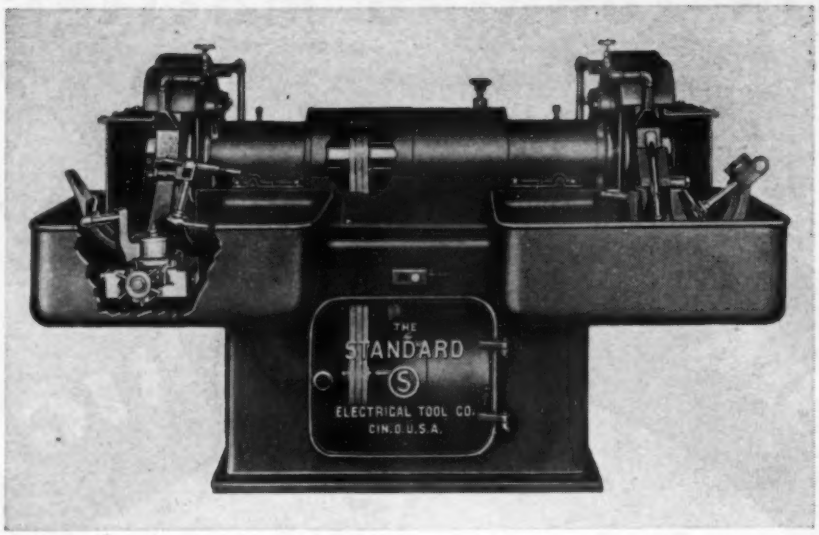
The Prestite safety gun has been redesigned so that the plunger which



actuates the fastener extends within the cup, thereby eliminating possibility of the fastener becoming disengaged or shooting out of the gun.

Acromark Bench Marker Handles Condenser Cap

Acromark Co., 9-13 Morrell St., Elizabeth, N. J., has available the No. 924 hand-operated marking machine. This bench type machine incorporates the principles of the Hercules type holder, the Nos. 921 and 927 marking machine. It has been built for marking condenser caps or covers, handling at the rate of about 2,000 pieces per hour.



Standard Chisel Grinder Has Redressing Attachment

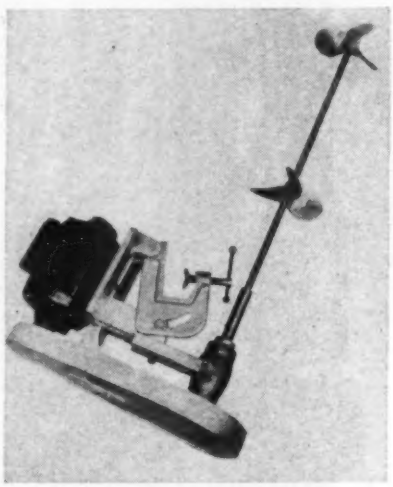
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio, is manufacturing a heavy-duty double-end grinder for grinding chisels. The machine features a chisel grinder attachment for handling a wide variety of chisel blanks, and is suited also for redressing used chisels. Resinoid bond wheels of 20-in. diameter and 2½-in. face are mounted on the spindle which operates at 1,700 r.p.m. This machine is equipped with flanges for 8 in. hole wheels.

Construction of the hoods or guards provide for quickly renewing the grinding wheels. Each guard is furnished with an adjustable nozzle with a valve for controlling the flow of water. A tank mounted on the back of the machine is fitted with a motor driven pump with 10 gal. per min. capacity.

United Industrial Mixer For Low or High Speed Mixing

A belt type portable industrial mixer is available from United Electric Motor Co., 178 Centre St., New York, N. Y. Precise speeds are obtained by pulley changes. The unit is complete with a.c. 110 volt, 60 cycle motor, two balanced propellers, 30 in. steel shaft and 10 ft. cord and attachment plug.

This mixer is designed so that the balanced hanger carries the weight of the unit below the center of gravity and the motor hangs outside the tank, away from corrosive fumes. Either alternating or direct current motors may be used. Belts and pulleys in this mixer are V-type and are interchangeable for low or high speed mixing. When mixing such materials as syrup or wax, the protective belt slipping can be arranged to prevent motor burnout when to prevent motor burnout caused by increased viscosity.

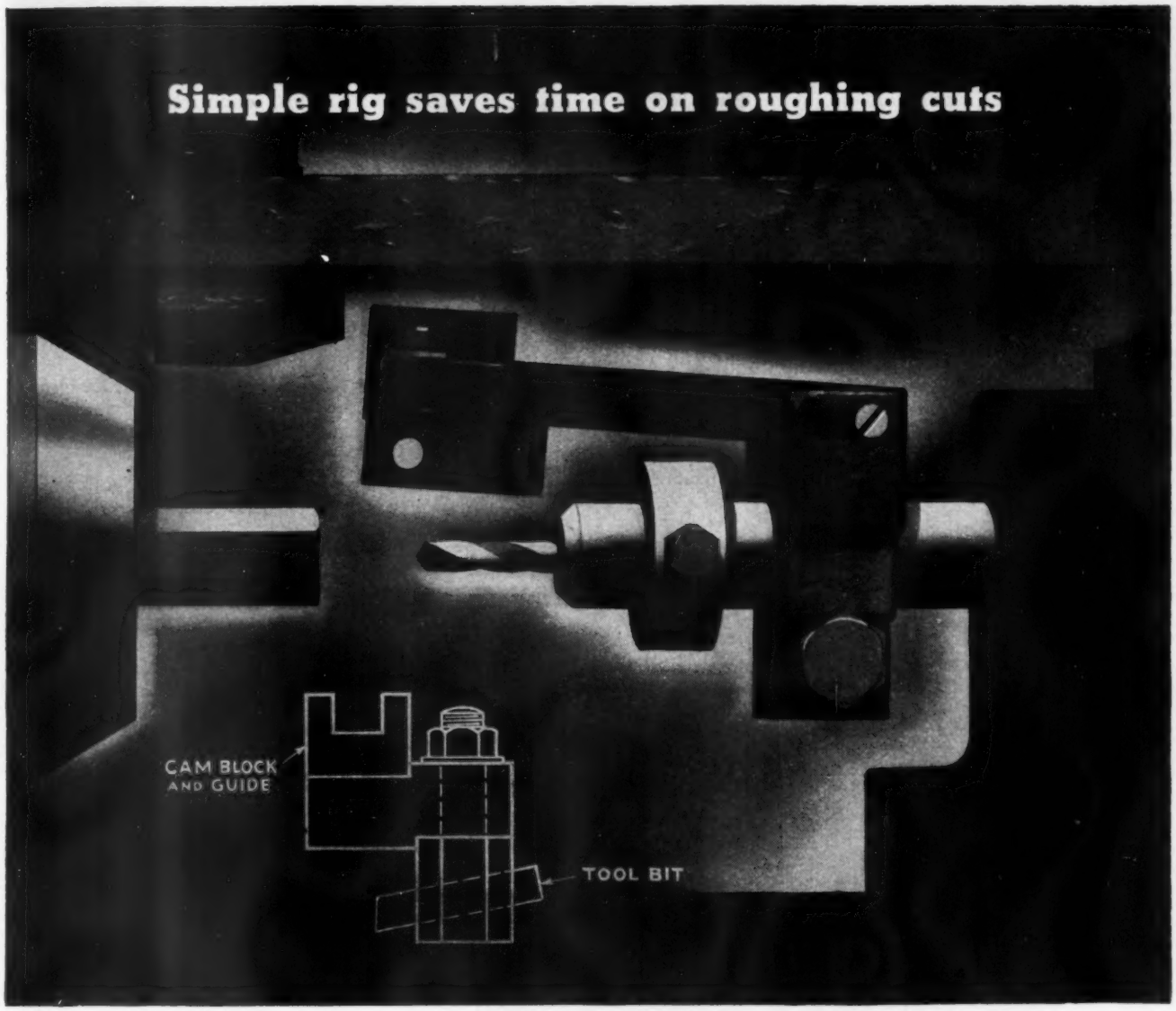


The bearings are combination radial thrust type. The heavy shaft, combined with the mixer's slow speed and rigid coupling allows for longer shaft lengths for deep tanks. Setscrews hold the slow speed type propellers on the shaft.

General Electric Instrument Detects Flaws in Tubing

General Electric Co., Special Products Div., Schenectady, N. Y., has available a high frequency electronic tube flaw detector for detection of longitudinal cracks and seams in non-magnetic metallic tubing. This instrument is capable of detecting and locating imperfections ½ in. long, 10 mils wide, and one-third of the wall thickness in depth, even

Simple rig saves time on roughing cuts



Information supplied by an Industrial Publication

Roughing tools conventionally mounted on turret lathes or hand screw machines have a tough time cutting hex bar stock. Intermittent cutting, accompanied by successive severe shocks make frequent resharpening necessary. This means equally frequent machine shutdowns.

The problem of eliminating the lost time on such jobs has been solved in a New England plant by an ingenious rig applied to some old turret lathes.

The rig consists essentially of two bars. One, carrying the roughing tool, is pivoted to the turret. The other, having a very simple adjustable cam on its lower side, is fastened between the top of the turret and a sliding support on the headstock.

As the turret advances the roughing tool, the cam feeds it downward, then guides it horizontally and supports it transversely while the roughing cut is made. A drill or other inside tool may be fed in to work simultaneously.

When the roughing cut is finished, the tool is backed off, and the finishing tool fed in on the cross slide. When the roughing tool needs resharpening, it is simply a matter of a few minutes to take it out of the holder and put a sharp tool in. Shutting down is unnecessary. There is less need for expert grinding and resetting.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue • New York City

MOLY

though the flaws are on the inside of the tubing and do not appear on the surface. The detector is especially suited for testing tubing for coolers and heat exchangers before installation. Power supply required is 100-125 volts, 60 cycles.

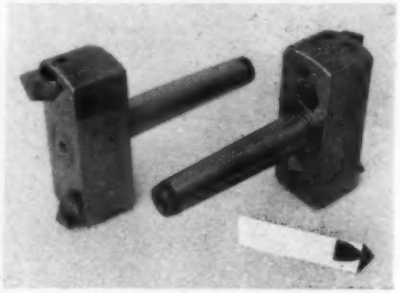
The tubing to be tested is fed through a coil box whose coils are arranged in such a way that they surround the tubing. After the circuit constants are set by means of selector switches located on the panel of a control unit, power is applied to the coils, which in turn induce eddy currents in the tubing. Changes in the eddy currents occur as caused by a flaw in the tubing. An electronic circuit in the control unit detects these changes and energizes a relay.

The detector consists of a control unit and a coil box which accommodates any one specific size of round, straight tubing of uniform outside diameter from ¼ to 2 in. inclusive. Additional interchangeable boxes are available for such tubing.

Weddell Triangular Toolbits Are Applied to Fly Cutters

Tri-Bits, manufactured by Weddell Tools, Inc., 1239 University Ave., Rochester 7, N. Y., have been applied to fly cutters, made with one or more teeth, set at suitable rake and shear angles. The cutter bodies are made of heat-treated alloy steel or Meehanite castings. Tri-Bit fly cutters 2½ in. diameter and up are furnished either with solid shank or the shell type to fit standard or special arbors.

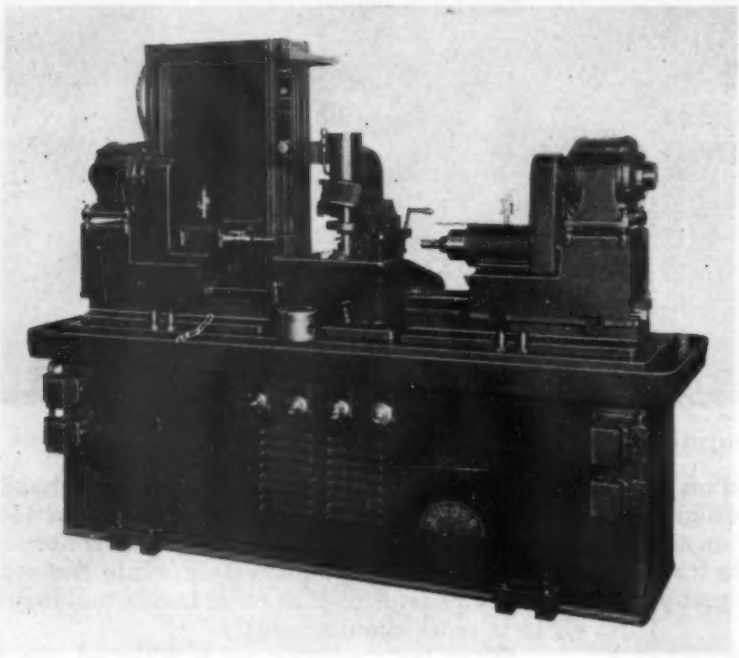
The cutter blades may be ground for roughing or finishing. Or, one



blade may be ground to cut on the diameter for roughing. The other is set ahead on the face and ground under diameter with a lead for finishing.

The triangular toolbits are locked in position and clamped into a V-shaped hole by a single lockscrew. The blade is backed up by a lockscrew and adjustable for size or wear. These Tri-Bits are supplied in high-speed steel, cast alloys or carbide tipped.

Snyder Hydraulic Counterboring Machine Used on Aircraft Piston Wristpin Holes



A special purpose machine for counterboring both ends of aircraft piston wristpin holes has been produced by Snyder Tool & Engineering Co., 3400 East Lafayette Ave., Detroit, Mich. Loading is manual, and the work is located by means of a pilot entering the piston. The center line of the wristpin holes is squared up by two manually operated locating fingers. The hydraulic clamping mechanism is operated by electrically controlled valves. Control buttons of the clamping mechanism are inoperative while the machine is in the work cycle.

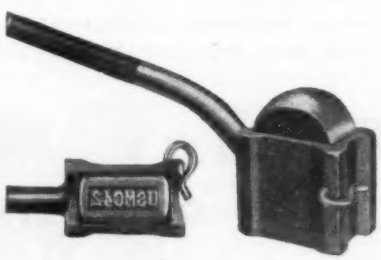
In the work cycle, the tools make a rapid approach and feed to the required depth against solid stops, feed return for the depth of the counterbore and then rapidly retract to the rear of the slide to allow ample loading clearance. Two-way feed is employed in this machine to assure high quality finish on the work. The spindles are provided with direct V-belt drive and are equipped with single point, tungsten carbide tipped tools.

The coolant tank is located in the rear of the machine, and coolant is fed to the work through the fixture to the inside of the piston. All hydraulic equipment is housed in the base, making the machine completely self-contained.

Cunningham Box Type Holder Marks Round or Square Pieces

An improved safety box type holder for marking purposes is being offered by M. E. Cunningham Co., 115 East Carson St., Pittsburgh 19, Pa. It is said that this device is applicable to operations previously using hand or sledge holders. It can be designed for marking round or square pieces either hot or cold.

A reinforced outer box, to which



Remember 1918?

Offhand you may not remember much of 1918 except that this was the year in which the first world war ended.

The chances are that you won't remember that that was the year in which modern high speed steel broaching was born—with the founding of Colonial Broach Company.

25TH colonial ANNIVERSARY 1918 1943

Few people cared—few realized the tremendous impact this new development would have on the future of metal working.

As a matter of fact it is our belief that few realize even today the place that broaching already occupies and will occupy in the near future—as the fastest and most accurate method of performing thousands of machining operations.

As a guide perhaps to the future, whether it be for war or for the peace to follow, Colonial has recorded in the Silver Anniversary issue of Broaching News the history of modern broaching development.

We would like to send you a copy. Ask for Broaching News Vol. V No. 3.

Originators of H. S. S. Broaching

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25th Anniversary

Broaches Broaching Machines - Broaching Equipment

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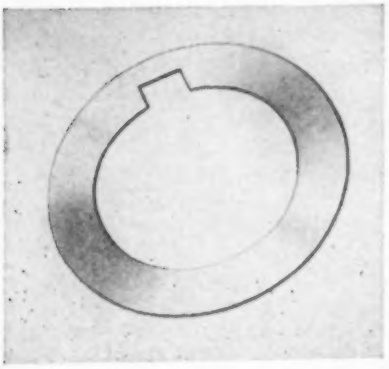
the handle is welded, levels the holder on the piece being marked and acts as a safety guard by preventing pieces of scale or chips from flying out. A shepherd hook pin, which holds this steel type holder in place, prevents the holder from falling out.



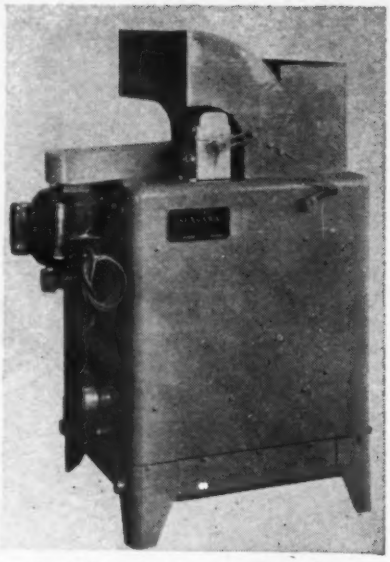
De-Sta-Co Arbor Spacer Permits Close Cutter Setting

A 0.0015 in. metal spacer, which permits setting of milling machine cutters down to as fine as 0.0005 in. spacing, has been produced by Detroit Stamping Co., 343 Midland Ave., Detroit, Mich. De-Sta-Co 0.0015 in. arbor spacers are now available in all standard arbor sizes.

They permit setting milling machine cutters to 0.0005 in. spacing.

Niagara Aero After Cooler For Cooling Compressed Air

An after cooler for cooling compressed air has been produced by Niagara Blower Co., 6 East 45 St., New York 17, N. Y. This Aero cooler uses the evaporative cooling principle which is claimed to obtain temperatures lower by 10 to 25 deg. than conventional equipment. It is said that this unit produces compressed air containing only one-half



to three-fourths the amount of water formerly experienced. The equipment is also applied to gases generated for industrial use. Water damage to equipment is thus prevented.

Parts and Materials

With this issue our editorial staff has gathered together in a section of its very own new PARTS AND MATERIALS developments in the world of Metal-Working. The idea is to make it easier for you to run your professional eye over the latest line-up, and harvest ideas for use today or tomorrow. A specialized, effort-saving service to help make this publication more than ever your "how-to-do-it" and "where-to-get-it" guide. Let us know how you like it.

Compars, New Plastics Group, Developed to Meet Demands for Flexible Material to Handle Solvents

The compars group of synthetic plastics, characterized as the missing link between plastics and synthetic rubber, have been developed by Resistoflex Corporation, Belleville, N. J., and are described as being transparent, flexible, wear-resistant and solvent-proof. Compars are derivatives of coal, limestone and air.

The name compars is used to distinguish between the basic polyvinyl alcohol resins, which are water soluble powders and the many derivatives, compounds and modifications which have properties unlike the original resin.

The material was developed to handle tuloul, xylol and benzol, solvents which quickly destroy most organic materials. The principal place where the need for such a material arose was in aircraft manufacturing plants for use in those parts carrying or exposed to the super-gasolines now in use.

Some of the compars are now being used in warplane fuel and hydraulic lines, naval diesel engines, chemical warfare equipment, Sperry Gyropilots and in other forms for protective gloves, aprons and shoe coatings to be worn by workers exposed to irritating petroleum solvents. Compars are available in tubing, sheets and as solutions, to permit its use in a variety of applications.

Production of compars into specified forms combines methods common to both the plastics industry and the manufacture of rubber. It is

7,000,000 miles . . . 50,000 passengers!

● SINCE MAY, 1939, Pan American Clippers have flown the Atlantic more than 1400 times . . . carried more than 50,000 passengers . . . logged more than 7,000,000 air miles.

And this is only one division of Pan American's World Airways System! BUT . . . before these record-breaking flights could be made, the famous Flying Clipper Ships had to overcome most formidable obstacles, within themselves—*friction and wear* of moving parts.

For this notable mechanical triumph, we can thank one vital mechanism—*anti-friction bearings!* They reduce friction . . . keep metal cool . . . postpone wear . . . and maintain precise location of parts.

NEW DEPARTURE ball bearings, by the *tens of millions*, are used in planes, ships, tanks, trucks, jeeps—and in the *machines* which make them. In fact New Departure has a major responsibility in the whole ball bearing war production program.

3177

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milled, as is rubber, but only a thin, cohesive film is produced, which has not yet completely fused. Unlike rubber, it does not have to be vulcanized. Conversion into finished and semi-finished products is accomplished by extrusion or molding. Molded compar products such as gaskets, washers and seals for holding solvents, aligning rings for the assembly of radio tubes and other electronic devices, transmission rings for delicate driving mechanisms and diaphragms of various kinds are already in use.

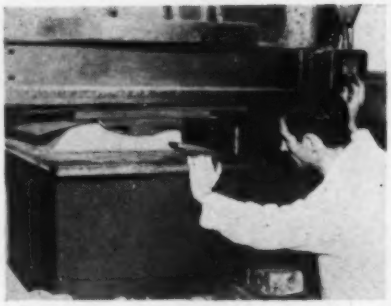
Compars in solution form are in a variety of compounds suited for special purposes. One such compound is now used for coating wire baskets in which are carried metal parts. A film is formed that is unaffected by sulphur base cutting oils and degreasing solvents and which prevents scratching and damaging of the parts. Another solution, when applied to shoes makes them oil-and-solvent proof. Other solutions are available for coating wood, fabric and paper. One interesting application of compar solution is as a paint for the inside of a wooden or composition-board fumigating box to make it entirely gasproof.

Physical properties of a typical compar formulation are as follows:

Property	*Extruded Compars*	*Molded Compars*
Tensile Str.	5236 psi.	2121 psi.
Elong. in 2 in.	213%	445%
Perm. Set	78%	80%
Cold flow	63.2%	63.6%

Control of operations in compounding and fabricating these materials will result in finished products of widely varying, predetermined durometer hardness, resistance to organic solvents, resilience, flexibility and translucence. Such controls include holding the loss of solvents during processing to within a range of plus or minus 0.1 percent; keeping thickness of the milled sheet within tolerances of plus or minus 0.001 in. and maintaining extruder temperatures within plus or minus one degree at three different points.

Los Angeles X-84 Rubber for Hot Magnesium Forming Sheets



X-84 rubber stock has been developed by Los Angeles Standard Rubber Co., 1500 East Gage St., Los Angeles, Calif. This stock is said to provide greatly increased service for hot magnesium forming sheets. Reports indicate satisfactory service in steam up to 325 deg. for an extended period. It is claimed that the forming sheets have exceptional resistance to tearing and smudging under heat when forming magnesium in a hot press.

Protect-O-Metal Compound Prevents Weld Spattering

A creamy liquid called Protect-O-Metal No. 2 has been made available by Protect-O-Metal Products, 79 South Sperling Ave., Dayton, Ohio. The material is a combination flux and spatterproofing compound for arc welding, and is brushed or sprayed into the seam to be welded and on surrounding surfaces. It is said that oxides and impurities are removed from the weld and porosity prevented. An increase of 2,000 psi. in tensile strength is claimed.

The effects of various solvents on the physical characteristics of a typical extruded compar formulation are as follows:

Test	*Specific Gravity at 72 deg.*	*Shrinkage or Expansion in 6 in., percent*	*Tensile Strength lb. sq. in.*	*Elongation in 2 in., percent*	*Hardness (durometer)*
Original Material	1.259	.....	5,236	213	85
Gasoline (leaded)	1.260	—0.30	5.255	220	85
Benzene (benzol)	1.251	0.30	5,290	225	84
Trichlorethylene	1.253	0.10	5,140	225	86
Ethanol (anhydrous)	1.181	—4.30	5,779	190	87
Ethylene Glycol	1.186	4.70	4.335	185	77
Acetone	1.246	—1.20	5,203	175	87
Petrohol	1.224	—1.30	5,971	165	89
Methyl Acetate	1.269	—0.70	5.403	185	85

Barnes Hacksaw Calculator Shows Cutting Time for Steel

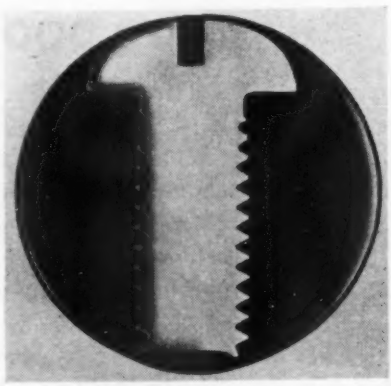
A hacksaw production calculator has been issued by W. O. Barnes Co., 1297 Terminal Ave., Detroit 14, Mich. The device shows the time necessary to make cuts with power hacksaws in various steel specifications. SAE, AISI and AMS specifications of steel are listed on the table on the reverse side of the calculator, and along with that information is given the machinability factor of these steels.

With this factor known, it is only necessary to set up on the slide the size and shape of the bar or nest of stock. The time required to make the cut is read over the machinability factor.

The instrument can be used for calculations in the shop or office.

No-Kase Steel Stop-Off Paint Permits Selective Carburization

No-Kase, a stop-off paint for selective carburization on steel parts in liquid carburizing baths, has been produced by Park Chemical Co., 8074 Military



Ave., Detroit, Mich. This compound provides protection on such sections as threaded edges. It is applied as a paint and is sufficiently dry within an hour for immersion in the carburizing bath. The heat of the bath burns out the vehicle of No-Kase paint and leaves the pigment as a continuous metallic coating.

Carey Packing List Protector Made From Asphalt Plyboard

A packing list protector fabricated from asphalt plyboard has been developed by Philip Carey Manufacturing Co., Cincinnati, Ohio, and distributed nationally by Western Paper Goods Co. of that city. The covers are available in sizes 6×8,

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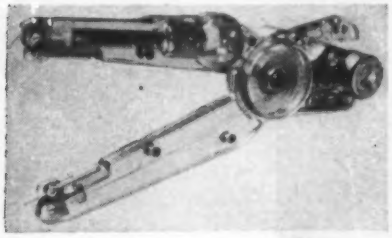
8×11 and 10½×13 in. and supplied in the natural black asphalt color and in range of colors required by various branches of the service. They are dished to take bulky packing lists, assembly instructions, and such and are affixed to the outside of the crates or boxes through prepunched nail starters.



Star Fuse Develops Pliers Of Lumarith Plastic Material

Star Fuse Co., 235 Canal St., New York, N. Y., is making pliers of Lumarith plastic for use in pulling and testing fuses. The transparency of the material enables the service man to observe a small inclosed bulb which lights up when a good fuse is checked. The end terminals can be opened for testing base receptacles.

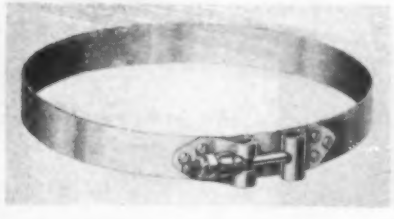
No-Spat Welding Fluid Used as Fume Suppressor

No-Spat welding fluid, made by Midland Paint & Varnish Co., Cleveland, Ohio, is a compounded mineral oil product of low surface tension used for reducing welding fumes and vaporization of zinc on galvanized coatings. The fluid is also recommended as a spatterproofing compound for application to welding jigs to minimize the work of cleaning off weld splatter after each job.

Marman Aluminum Alloy Clamp For Supercharger Installation

An aluminum alloy clamp for use in ventilation, carburetor intake, supercharger, intercooler and similar installations has been made available by Marman Products Co., Inglewood, Calif. This clamp is made in sizes from 2 in. diameter up and in an almost unlimited range of shapes.

The ends of the band are wrapped over a circular crossbar anchor at each attachment to the adjustment mechanism, resulting in an even distribution of loads.



National Silver Babbit Alloy Provides Tin-Base Substitute

Silver babbitt is being produced by National Bearing Metals Corp., 4930 Manchester Ave., St. Louis 10, Mo. This material provides a substitute for tin-base babbitt and is said to have the same bondability and corrosion resistance and to retain its hardness at operating temperatures without squeezing out. Silver has been alloyed with a properly balanced lead base babbitt to produce this material with physical characteristics comparable to those found in tin base babbitts.

American Optical Makes Tailored Leather Welding Suits for Women

Tailored uniforms for women welders are now available through American Optical Co., Safety Div., 70 West 40 Street, New York, N. Y. The

suits are made of chrome-leather and tailored from dressmakers' patterns to fit body contours.

Most distinctive in the new outfits are the stylish leather jackets and leather welding hats, especially designed by a leading hat maker, for use beneath welding helmets.

Leather uniforms are being advocated for women welders for safety reasons. Chrome-leather resists burning and guards against destructive action, a type of protection not given by ordinary clothing.

Pioneer Seal-Less Pump For Use on Small Machines

Model MVA seal-less pump has been introduced by Pioneer Pump & Manufacturing Co., 19669 John R, Detroit, Mich., for use on small machines such as hand mills, surface grinders, internal grinders, drill presses and tapping machines. The pump is just under 16 in. high. It is a submerged type unit and in-

tended for machines having a coolant sump in their base or for machines provided with separate coolant tanks. For use with the separate tanks, brackets and flanges are available for mounting the pump on the edge, side or top.

Southern Cottonleather Fabric Used for Mountings and Shims

Cottonleather fabric, for such applications as mountings for motors and radiators, shims for auto and truck bodies and as a leather substitute, has been developed by Southern Friction Materials Co., Charlotte, N. C. The fabric is available in sheets 18×72 in. and in 5 and 7 iron weights.

This fabric consists of a heavy multi-ply inner-woven cotton fabric, which is impregnated, cured, calendared and ground by a special process. Cottonleather is waterproof and water repellant, and is said to be wear- and heat-resistant. It is claimed that the material can be held at 300 F. for three hours before scorching. It can be held to close tolerances.

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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

In the time of the Revolution, our colonial furnaces produced 30,000 tons of iron a year. Out of this tonnage, General Washington armed his troops and won our freedom.

★ ★ ★

In this war of the world . . . America is producing more than 90 million tons of steel ingots a year — more than all of the rest of the world combined — with virtually every ton going into fighting steels for our fighting men.

★ ★ ★

Such is the measure of the growth of our iron and steel industry in the years of our Republic. And the very growth of our country has been written in the fiery chapters of steel's expansion . . . for it is steel that built our industries, our railroads, our highways, our towns and cities, and knit this continent into a community by the development of our rich resources. So we have enjoyed our freedom . . . and by enterprise, ingenuity, science, and skill created a way of life and living that is American.

★ ★ ★

Holding fast to this freedom—securing it anew for the brave, new era that lies ahead for America —is now the measure of steel's productivity in overwhelming quantity as it serves directly on all fronts and helps to marshal other materials and metals for military duty.

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First of our fighting metals . . . steel is likewise the strongest, most serviceable, adaptable metal for the peaceful arts. It is in this role that steel looks to the future, for this war that has sharpened steel's fighting tools has also put a keen edge on its ambition and ability to create new things for a new world of peace and progress and prosperity.

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With steel we measure our freedom . . . secure it . . . defend it . . . share it with all mankind.

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TRADE PUBLICATIONS

BUCKETS Three new booklets on the care and maintenance of orange peel, clam shell and electric motor type buckets have been published by the Hayward Co., 50 Church St., New York 7, N. Y.

COMPRESSORS Schramm, Inc., West Chester, Pa., has issued a booklet describing, picturing and giving specifications of its line of portable and stationary air compressors.

CORROSION "The Touch of Death to Steel," is the title of a bulletin being sent by Angier Corp., Framingham, Mass., to distributors and field representatives. The publication pictures, and explains the use of that company's corrosion inhibitive dual wrapper, designed to protect finished metal parts from damage due to contact with perspiration and other moisture.

GAGES The Vinco Corp., Detroit, Mich., offers a 16-page booklet, "Millionths of an Inch for Sale," in which are pictured and described that company's line of gages and inspection equipment.

GRINDER A broadside prepared by Norton Company, Worcester 6, Mass., is devoted to a pictorial presentation of that firm's multipurpose grinder. Described as finding "its particular field of utility in miscellaneous, small-lot general production or in toolroom work," the grinder is available with 12, 14 and 16 in. swings, and in 36, 48 and 72 in. lengths. Complete specifications of each type are given.

HEAT TREATING SALTS The classifications and applications of metal salts and their compounds in heat treating are presented in a bulletin prepared by G. S. Rogers & Co., 228 N. La Salle St., Chicago 1, Ill.

HOOK CHECKER An 8-page, illustrated technical bulletin, No. HC-43, describing the hook checker manufactured by the Detroit Tap & Tool Co., 8432 Butler Ave., Detroit 11, Mich., has been made available. This hook checker, it states, is designed to enable operators, when sharpening thread milling cutters, gear hob, etc., rapidly and accurately to check whether or not the cutter has been ground to the correct angles and spacing.

HYDRAULIC MACHINERY Two new bulletins on hydraulic machinery have been issued by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich. Bulletin SM843 describes special units, such as molding, bending, broaching, two-way drilling, flame-hardening, piercing, and spot facing. Bulletin

PT845 describes a floor-level hydraulic press, an arbor press and a vertical one.

LABOR UTILIZATION A non-technical explanation of production management methods is presented in a 32-page pamphlet, "Production Management," issued by the Bedaux Co., 6300 Chrysler Bldg., New York, N. Y. Topics discussed include incentive wage plans, job evaluation, labor cost and expense control, and planning and scheduling.

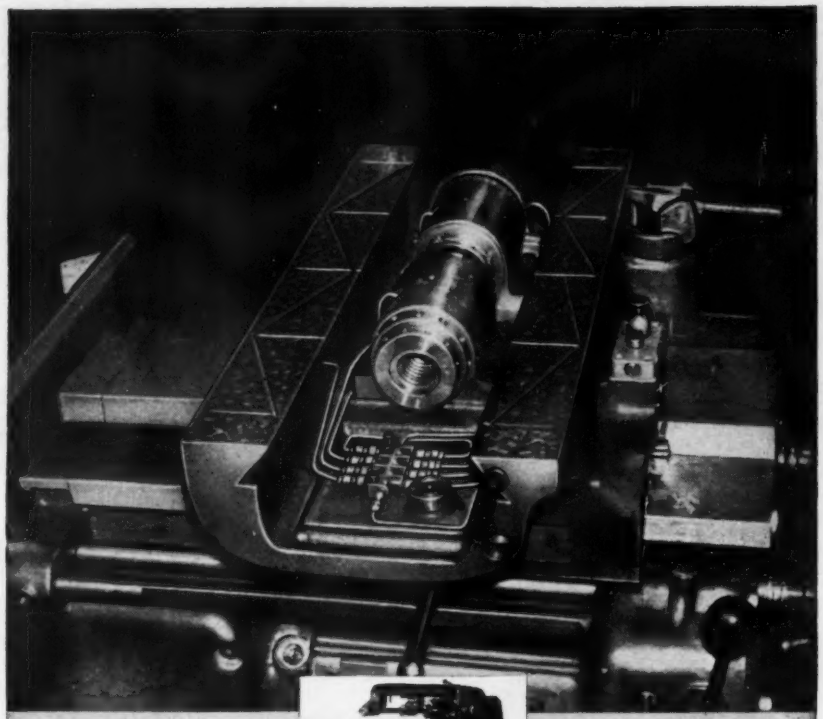
LATHES The entire line of products of Gisholt Machine Co., 1201 E. Washington Ave., Madison, Wis., including turret lathes, automatic lathes, and balancing machines, is portrayed in a new 3-color, 32-page "picture" catalog. The book does not attempt to include full technical data on all Gisholt machines, attachments, and tools, but does show, in a concise manner, the various types and sizes of machine tools through large photographs accompanied by principal specifications and brief running description.

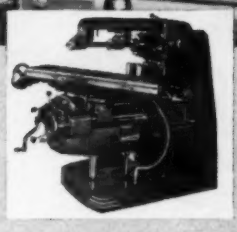
LUBRICANTS Dept. 15, Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa., as part of its campaign to improve lubrication methods and practice, has published a booklet summing up the accumulative results of its experience, and entitled "What Makes a Grease." This booklet briefly discusses the standards by which a good grease should be judged, points out the various factors which should influence the selection of the proper grease for a specific job and explains the services offered in the study and solution of lubrication problems.

MATERIAL CONTROL "Accounting and Control Manual," a 45-page booklet issued by Cooper-Bessemer Corp., Mount Vernon, Ohio, discussed operations of shops, foundries and assembly floors, methods for controlling engineering design, purchasing and storing materials, inspection, inventory and other activities involved in the company's operations. Also included are a glossary of office, shop and product terms, and a cost flow chart.

MATERIAL HANDLING Circular No. 134 of the Lyon-Raymond Corp., 1352 Madison St., Greene, N. Y., briefly illustrates and describes that firm's general line of material handling equipment. Included are various types of hydraulic-lift trucks, elevating table, welding positioner and aircraft production and servicing equipment.

METAL CHILLING The first of a series of booklets on cold treatment of metals has been issued by Deepfreeze, North Chicago, Ill. The 24-page "Technical Data and Operating Manual" describes the use of Deepfreeze industrial chilling machines for the shrinking, testing, hardening and stabiliza-





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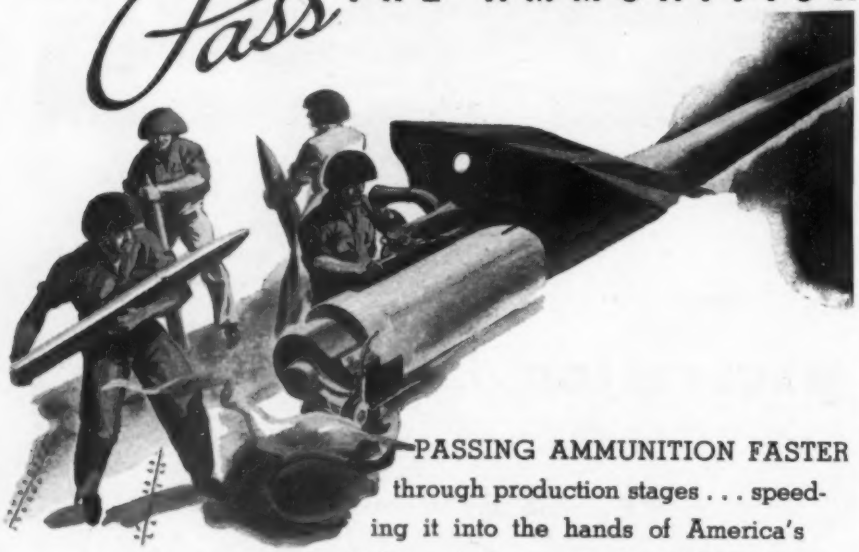

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MATHEWS CONVEYER COMPANY ELLWOOD CITY PENNSYLVANIA

tion of metals, with illustrations and technical data.

MICROMETERS The George Scherr Co., 128 Lafayette St., New York 13, N. Y., has issued a new 8-page folder describing Reed micrometers, for which that firm is the exclusive distributor. The folder announces the new policy of producing 1-, 2- and 3-in. micrometers with vernier reading to tenths only.

PAINT A new catalog issued by the American-Marietta Co., 43 E. Ohio St., Chicago, Ill., lists the Valdura line of heavy duty industrial maintenance paints, gives application suggestions, product descriptions and technical data.

PIPE AND TUBE BENDING The Copper & Brass Research Assn., 420 Lexington Ave., New York 17, N. Y., has published a treatise showing methods and devices for bending pipes and tubes of copper and its alloys. Included are tables of unit weights of tubes of different alloys with varying diameters, wall thicknesses and shape, as well as pertinent information on the chemical and physical properties of such pipe material.

PIPE TOOLS The 1944 catalog of Beaver Pipe Tools, Inc., Warren, Ohio, pictures, describes and prices that company's line of cutters, threaders and allied pipe working tools and machines. Available also is a condensed catalog for jobbers' salesmen's loose-leaf books.

SAFETY VALVES Simplified Practice Recommendation R201-43, Iron and Steel Pop Safety Valves, has been issued by the National Bureau of Standards, U. S. Department of Commerce, and is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. for 5 cents.

SOAP "Soap in Lubricants Speeds up War Production," issued by the Association of American Soap and Glycerine Producers, 295 Madison Ave., New York 17, N. Y., details some war uses of soap as a lubricant in producing shell and cartridge cases, wire drawing, and in cold drawing certain types of steel.

STOKERS Operating and maintenance hints for efficient operation and minimum outage are listed in two new "Check Charts for Single-Retort and Multiple-Retort Stokers," announced by Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The charts are designed to make regular and thorough inspection of stokers easy.

STUDS AND INSERTS "The Rosan Locking System," is a 4-page bulletin, issued by Bardwell & McAlister, Inc., 7636 Santa Monica Blvd., Hollywood

28, Calif., describing applications and giving installation instructions for Rosan threaded inserts and locked-in studs.

TESTING INSTRUMENTS Electronic instruments for testing aircraft and industrial equipment and instruments are described in a 48-page catalog issued by Televiso Products, Inc., 6533 N. Olmstead Ave., Chicago 31, Ill.

TOOL GRINDERS The K. O. Lee Co., Aberdeen, S. D., has issued a catalog insert describing its new line of "Knock-Out" universal tool grinders, with illustrations showing the units tooled for various operations. Specifications are given, and available fixtures listed and pictured.

TRAINING A manual, "Training Women for War Work," has been prepared by and is available from Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington, D. C., for the guidance of those charged with manning and training in war production plants.

TRUCKS AND CASTERS Thomas Truck & Caster Co., Mississippi River & K St., Keokuk, Iowa, has issued a catalog designed to facilitate the selection of the right truck for the handling job.

VARIABLE SPEED PULLEYS Engineering Manual No. 1210, issued by the Speedmaster Co., 1201 Thacker St., Des Plaines, Ill., describes the Speedmaster variable speed pulley in its various applications and available types.

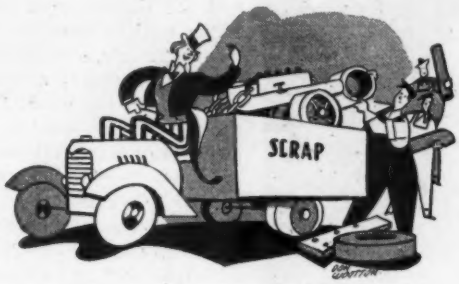
WELDING Allis-Chalmers Mfg. Co., Milwaukee, Wis. has released a 4-page bulletin setting forth the advantages of the 400 amp. size of a.c. welder it produces. A pictorial section shows the step-by-step construction and internal assembly of a continuously variable heavy duty a.c. welder. Complete electrical performance data on this unit at all loads is given.

NEW BOOKS

RADIOGRAPHIC INSPECTION OF METALS—*By Otto Zmeskal. 150 pages. Published by Harper & Brothers, 49 East 33 Street, New York, N. Y. $2.75.*

Under the impetus of wartime demands for metal products of almost flawless quality applications of the radiographic inspection of metals have expanded tremendously during the past few years. Used first as an inspection tool only, radiography is now being used extensively to study new techniques of welding, casting and forging.

As a general introduction to a com-



57,400,000 TONS OF SCRAP!

That's what Uncle Sam must collect!

That's what the steel industry of the United States will need to meet its war production program.

Do you realize how much scrap this is? It would take 771,000 freight cars to haul this tonnage. They would make a train 6,717 miles long!

Why is so much scrap needed? In making steel, the normal mixture that goes into the furnaces is 50% scrap and 50% pig iron. In foundries the proportion of scrap to pig iron is much higher. So we in this country must actually produce more scrap than pig iron if we are to keep the war production program going full-blast.

It is an actual fact that half of every ship, half of every tank, half of every gun, used by our Armed Forces, is made from scrap.

The scrap piles of the nation's steel plants are running low. This time it will take "fine-tooth-combing" to replenish our stock. Every farm, every factory, large and small, every shop, store, office and home must start its own drive for scrap.

You can help! Everybody can help! Start now to get out everything made of iron or steel that you do not absolutely need. Get it out where Uncle Sam's trucks can pick it up.

REMEMBER—our boys out there on many fronts need it—and they are depending upon you to get it. So everybody dig, dig, dig for SCRAP!

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

GENERAL OFFICES · CLEVELAND · BULKLEY BLDG.
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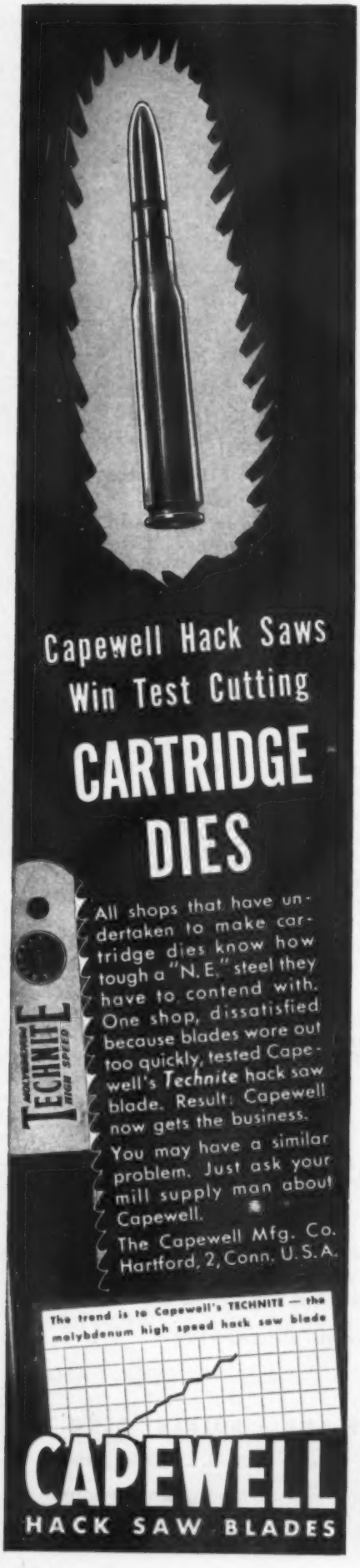
Capewell Hack Saws
Win Test Cutting
CARTRIDGE
DIES
TECHNITE
All shops that have undertaken to make cartridge dies know how tough a "N.E." steel they have to contend with. One shop, dissatisfied because blades wore out too quickly, tested Capewell's Technite hack saw blade. Result: Capewell now gets the business.
You may have a similar problem. Just ask your mill supply man about Capewell.
The Capewell Mfg. Co.
Hartford, 2, Conn. U.S.A.
The trend is to Capewell's TECHNITE — the molybdenum high speed hack saw blade
CAPEWELL
HACK SAW BLADES

paratively new science, Mr. Zmeskal has prepared this volume from lectures used in his classes on the subject at the Illinois Institute of Technology. The author does not attempt to deal with the physical theory behind radiographic inspection or discuss at length the apparatus used. He does, however, give a suitable introduction to actual operational techniques.

After briefly discussing the production of Gamma- and X-rays, Mr. Zmeskal covers the principal points in radiographic practice fundamentals. Nearly half of the book is devoted to an explanation of applications of this science, a glossary of terms, a list of selected reference works and tables used in radiography. Actual radiographs and line drawings serve to amplify the textual explanations.

•

A COURSE IN POWDER METALLURGY—*By Walter J. Baeza, president, Industrial Research Company, and instructor of powder metallurgy, College of the City of New York,* 212 *pages. Published by Reinhold Publishing Corporation,* 330 *West* 42 *St., New York,* 18, *N. Y.* $3.50.

Powder metallurgy has captured the imagination of many people engaged in war production for it has proved a means of making many complicated metal parts to close tolerances in less time and with less skill than by machining. In fact, this aspect of powder metallurgy has made enormous strides since the war started, although actually the process was born in 1829.

This timely book discusses three important phases of powder metallurgy, namely: (1) production of metal powders, (2) compacting, and (3) sintering. Manufacture of powders is discussed with respect to several methods, and considerable information is given on the classification of particle size, and the current theories on how this affects cohesion. More than half of the book is however given over to laboratory techniques for fifteen experiments so that the college student gains a better insight into basic problems in powder metallurgy. The instruction course outlined is intended to provide skill in evaluating raw materials and powder-metal products.

•

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION FOR 1942. *Published by the U. S. Government Printing Office, Washington, D. C.* $1.50.

In this report, the first covering the Smithsonian Institution's activities since the United States entered the war as an active participant, much attention is given to the efforts of the institution's staff in helping other government groups. During the year 460 requests were received from war agencies for special research of information. Half of these were received from the War and Navy departments.

The first portion of this volume is devoted to a resume of the activities of the various branches of the institution such as the National Gallery of Art and the Astrophysical Observatory. These are in the form of reports to the board of regents from the secretary, Dr. C. G. Abbot. The remainder of the volume is a compilation of scientific papers, both original on the part of staff members and published elsewhere, which are deemed worthy of the interest of scientific minds.

Perhaps of greatest interest to the public at large is the news given in the report that the long-standing controversy between the institution and Dr. Orville Wright now appears to be ended. This dispute raged over the question of who developed the first airplane capable of sustained flight carrying a man and resulted in the Wright plane being sent to an English museum rather than the Smithsonian. It is now believed that the Wright Brother's plane will be returned here at the end of the war.

SIXTY YEARS AGO

(From the November 17 and 24, 1883 Issues of AMERICAN MACHINIST)

NYC Rebuilds, Salvages

Doing "very heavy repairs to many of the old engines which came into their possession by the purchase of roads in operation," the New York Central and Hudson River Railroad Shops, West Albany, "find it does not pay to work with antiquated tools, and are selling a great deal of their old machinery and replacing it with the most modern appliances. This road pursues the policy of working up old material into the forms from which the new appliances are constructed, so far as economical."

New Engine Lathe

Pratt & Whitney Company, Hartford, Conn., had newly brought out a 19-inch engine lathe, of which "The carriage is gibbed the entire length of the outside, and is furnished with a tool-post by which the tool may be adjusted for height without being loosened in the post, and rigidly held at any angle."

The Wheel Is Here to Stay

Reporting to the First Annual Convention of the American Street Railway Association, Chicago, a committee objected "to all forms of locomotives, owing to the inability to secure sufficient friction to propel crowded cars under difficulties." The report stated " 'they have an insurmountable barrier to overcome so long as they

NEW THREAD-GRINDING ECONOMY ON COMMERCIAL PRODUCTION

PRECISION MECHANISMS • AIRCRAFT ENGINE PARTS
MACHINE TOOL PARTS • ORDNANCE COMPONENTS • PRECISION THREADED PARTS
INSTRUMENT PARTS • PRECISION GAGES

Greatly increased production of thread grinding ... ces a far more accura... pre... read of superior finish ... ible with other methods, may be achieved with Sheffield Precision Thread Grinders. These are the first American designed machines on which either the multi-ribbed or single-ribbed wheel may be used.

The finished thread may be formed in one plunge cut with the multi-ribbed wheel—high production of high quality. Multiple threads are ground in one pass without necessity for precision indexing.

Fine threads can be ground AFTER hardening, especially on thin-walled components, eliminating objectionable stresses and possibility of distortion—also assures thread being held concentric with other ground diameters and threaded sections of work part.

Substantial savings in operating time over conventional machines make it more economical to grind threads with a Sheffield Thread Grinder. Also because of these savings, it is now feasible to grind threads formerly produced by other methods.

WRITE FOR FULL DETAILS • BULLETIN M-100-143

SHEFFIELD MASTER CRAFTSMEN

ARMY E NAVY

W-S Standard Lathe Centers with carbide tips. Morse, Brown & Sharpe and Jarno tapers for both TURNING and GRINDING.
STANDARD
CEMENTED CARBIDE TIPPED
CENTERS

SAVE ON SET-UP, ADJUSTING and GRINDING TIME with these more *accurate* W-S Lathe Centers. Their concentricity is *guaranteed* to within .0002" or less! Made by entirely different method of manufacturing, W-S Centers help assure the highest degree of precision work from your machine tools. Genuine CARBOLOY tips (other carbides may be specified) reduce friction and give a cooler, more perfect bearing. The craftsmanship inherent with all W-S Centers goes far beyond the point of visual inspection. However, it is evidenced in their ability to maintain greater accuracy while outlasting from 10 to 60 ordinary centers. Carbide tipped tools are not just a specialty with us . . . we make them *exclusively*. The majority of sizes is available from stock most of the time. Write for FREE Catalog 942-A and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Branch Warehouse: Long Beach, California.

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: 1/2 to 1-1/2.
W-S Standard Reamers with Carbide Tips. Tapered and straight shanks. Sizes: 1/4 to 1-1/2.

WENDT SONIS
CARBOLOY CUTTING TOOLS
CENTERS ★ DRILLS ★ CORE DRILLS ★ COUNTERBORES ★ SPOT FACERS
END MILLS ★ REAMERS ★ HOLLOW MILLS ★ LATHE BITS ★ SPECIAL TOOLS

rely upon merely rotating the wheels to apply the power.' Wire ropes, the pet scheme of the committee, will work, but the plan is expensive and troublesome."

SEEN and HEARD

By JOHN R. GODFREY

Will Wood Come Back?

Advocates of aluminum and magnesium as coming materials for machines and other products may be in for a surprise from unexpected sources. Makers of wood products are surveying fields heretofore occupied exclusively by metal. Automobile bumpers of wood that is strong and resilient seem a distinct possibility. They are lighter than steel, seem to be equally protective and should cost less to make.

Another possible use is where high speed reciprocations make it necessary to use aluminum or magnesium. Pitmans or connecting rods of farm machinery have been made of wood for many years. Some feel that similar uses may be made in other classes of machinery.

Then there is the possibility that plywood for automobile doors, trunk lids and the like is a distinct competitor of the lighter metals. This is a field in which plastics have been advocated but it seems doubtful if any so far developed have sufficient strength or stability. It seems quite probable that wood may be a real rival to metals in a number of fields.

Develop Block-turning Lathe

German engineers have developed a new method for machining large forgings and castings of quadrangular cross-section to overcome objections they had against using planers for this type of work. The method involves a special lathe on which the tool and work both move. Blocks approximately 25×25×39 in. can be handled.

The first step was designing a lathe on which the cutting tool and the carriage move back and forth horizontally. This movement is linked to the spindle rotation by a worm gear mechanism which prevents the forming of a round shape as in ordinary lathe operation. Horizontal tool displacements depend upon the cross-section of the block. A cam mechanism links movement of the spindle with the tool movement. Using this type of lathe requires a special cam for every practical size of block.

A major disadvantage of the original method came from the fact that the working angle, between job and tool, varied throughout the whole op-

eration. This resulted in a poor finish and extremely short tool life.

In a refinement over the original method, these objections were overcome by adding a rotary movement of the tool. This keeps the working angle close to 90 deg. Through the complicated mechanism required, several forces are working on the tool.

Conclusions reached by the German engineers who reported on the development in the magazine *Stahl und Eisen*, (March 4, 1943), are that this method increases the economy of operation, as compared to planing, by reducing set-up time, eliminating time needed for a return stroke of the tool and increasing tool life.

Castings Made Without Patterns

BY JOHN J. CAVANAGH

Starting from scratch and delivering an accurate and more or less involved steel casting in a few hours can be accomplished in any machine shop. The procedure involves the making of a mold from various thicknesses of graphite sheets and clamping them together. Cores and recesses may be provided by holding small graphite pieces in place with machine screws and filling the screw holes with graphite cement. Sheet graphite for this purpose is inexpensive, can be obtained from manufacturers in a large variety of thicknesses, and can be readily worked with hacksaws, files and drills.

A graphite mold made in this manner can, of course, be used but once; nevertheless, the method is applicable where only one casting is needed urgently. Draft is not a consideration when making the mold, but a shrink rule must be used. Due to the nature of the graphite, a high degree of accuracy is obtained, and the casting is entirely free from scale and oxidation.

The only special accessory utilized is the simple equipment for handling Thermit. However, this may be dispensed with if there is access to a steel furnace.

Industrial Casualties

According to the National Safety Council, accidental death to wartime workers, on and off the job, still are running far ahead of deaths to American fighting men on all fronts. Casualties to the U. S. Armed Forces since Pearl Harbor have been 20,104 dead, 28,226 wounded, 32,905 missing, and 23,970 imprisoned—a total of 105,205. These figures are from the latest report of the Office of War Information. Casualties to American workers through accidents since Pearl Harbor are 80,000 dead and 7,000,000 injured on and off the job.

BOTTLENECKS

DAMN THE TORPEDOES

FULL SPEED AHEAD!

● Making only Mounted Wheels and small Grinding Wheels — maintaining highest quality in spite of large quantities and rush orders—shipping them promptly—*this is our job, our battlefield.* With full WPB approval, we stopped making all large size grinding wheels and fixed our sights on wheels *3" in diameter and under.*

We worked all around the clock, 24 hours a day, and in a short time were able to fill orders on time—And, our central location cuts time in transit. Today, there is no waiting. With the Army-Navy E at our masthead, we are going full speed ahead.

ARMY E NAVY

Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry. You can bank on us.

TEST WHEEL FREE — To get acquainted with Chicago Wheels, let us send one postpaid. Tell us size wheel and material you wish to grind.

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AMERICA'S HEADQUARTERS FOR MOUNTED WHEELS SMALL GRINDING WHEELS

CHICAGO WHEEL & MFG. CO.

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☐ Mounted Wheels ☐ Grinding Wheels

☐ Send Test Wheel. Size .....

Name .....

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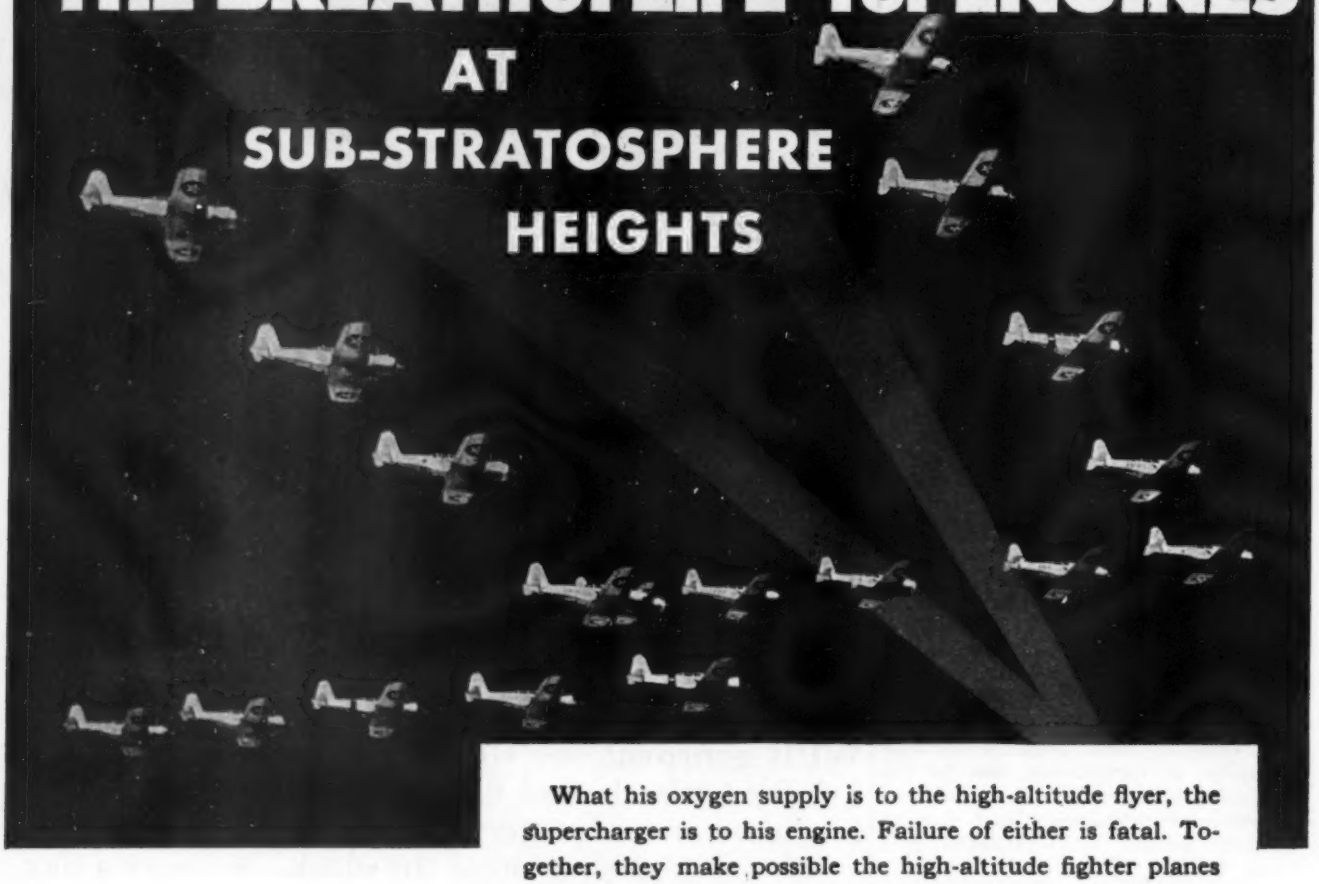
Norma-Hoffmann Precision Bearings Help Supply

"THE BREATH of LIFE" for ENGINES AT SUB-STRATOSPHERE HEIGHTS



What his oxygen supply is to the high-altitude flyer, the supercharger is to his engine. Failure of either is fatal. Together, they make possible the high-altitude fighter planes and bombers that are playing so conspicuous a part in today's warfare.

In the use of anti-friction bearings in superchargers, as in so many other aviation applications, NORMA-HOFFMANN pioneered the way. The terrific speeds of supercharger operation —often as high as 60,000 RPM—demand that ULTRA-PRECISION long characteristic of NORMA-HOFFMANN BEARINGS. And today, not only in superchargers but elsewhere at vital points throughout the plane, NORMA-HOFFMANN PRECISION BEARINGS are doing their part in winning air supremacy for the Allied Air Forces in every theatre of war.

"Where the bearings MUST NOT fail"—in engines, control mechanisms, instruments, armament, radio equipment and other aircraft accessories—they are providing that combination of speedability, load capacity and dependability so vital to the unfailing performance of the plane.

Let our engineers work with you.

"NORMA-HOFFMANN"

PRECISION BEARINGS

BALL, ROLLER AND THRUST

NORMA-HOFFMANN BEARINGS CORP'N, STAMFORD, CONN. . . . FOUNDED 1911

"Pioneer Suppliers for 20 Years of Ultra-Precision Bearings for Superchargers"

TO WIN THE WAR—*Work—Fight—Buy War Bonds!*

CUT FINISHING COSTS WITH

MACHINES YOU DON'T HAVE TO "BABY"

Haskins Flexible Shaft Equipment will take your worst . . . *and do it Longer!*

HASKINS Flexible Shaft units are no single operation machines. They're rugged. They're versatile. Capable of handling many kinds of jobs. Workmen *like* these easy handling machines. Because they can turn out more work—and better work—with them. The front office *likes* them. Because they give longer, trouble-free operation. Send for Catalog 45. Shows many ways to speed production with flexible shaft equipment. R. G. Haskins Company, 2760 W. Flournoy St., Chicago.

Finishing Costs are less with Haskins Equipment

Where is your bottleneck? Heavy duty grinding? Sanding? Polishing? Rotary Filing? Wire Brushing? There's a Haskins unit specially engineered to meet your particular requirements. With the right power, the right mounting, the right drive (direct or multi-speed countershaft) for the needs of every machine shop, die shop or foundry. Capable of handling not one but *many* operations.

Type RB-6

½ H.P. heavy duty, direct drive unit. Low pedestal (bench high) mounting.

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Flexible Shaft

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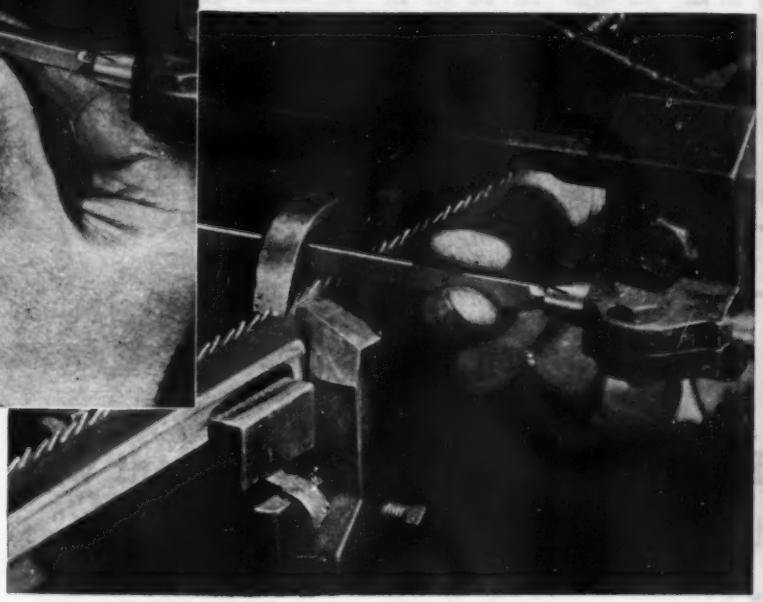
More VERSATILE Machines for More PROFITABLE Work

NICHOLSON SAW FILE HOLDERS

(POINT AND TANG HOLDERS)

provide permanently accurate alignments . . . simplify rotating, removing, replacing and positioning of files . . . effect DECISIVE time savings in operating saw filing machines

INSERTING FILE. Push back the spring plunger of the point holder. Insert tang in tang holder; triangular socket engages file on precision surfaces at *shoulder* – not at less carefully forged tang itself. Insert point and release plunger. Position file to proper saw-tooth angle and tighten set screws. *One* positioning does it—for the entire job!



TURNING FILE. Push file forward (compressing plunger) to disengage shoulder end. Rotate file to bring fresh cutting edge into action. Release plunger, letting file spring back into permanently gauged position. Uniformly sharp saw teeth, uniform file wear, maximum file life assured!

NICHOLSON File Holders for repetitive machine filing (principally saws) are a great improvement over methods which involve infinite making and undoing of adjustments. Note the simple, methodical procedure described above. No hand-and-hammer wedging of file into holders! No "unwedging" or loosening of set screws to turn or remove file! No repeated hand-gauging!

Any filing-machine operator can see for himself the time and money-saving advantages to be gained. Whether the job is filing one saw or a hundred of the same kind and size, one positioning of file and holders is usually sufficient.

Saw manufacturer, service saw-sharpener, or industrial plant using filing machines—get all the facts. Consult any mill-supply house handling Nicholson or Black Diamond Files—or write us direct stating your particular machine-filing requirements. No obligation.

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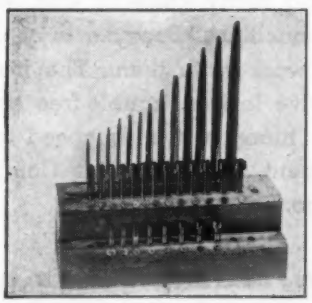
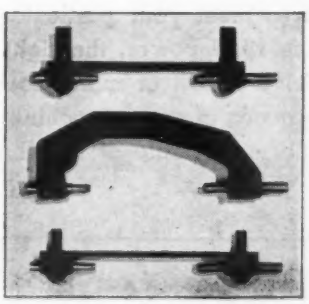


HOLDERS for every size triangular file. **COMBINATION BRACKETS** to fit all standard saw-filing machines – Anderson, Cleveland, Foley, Seigmeister, Wardwell, etc.



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FOR EVERY PURPOSE

"JUST LIKE WE USED BACK HOME!"

Yes, those Monarch lathes which many of our fighting men found so dependable back home, are now equally hard at work, all over the world. In supply and repair depots and bases, they are busy day and night, helping to keep our fighting equipment in good order.

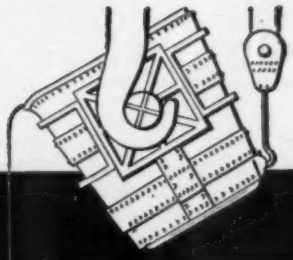
Even such rough handling as pictured here cannot stop the precision performance of these ruggedly built, rigid tools. They stand up and take it, whether on advanced bases abroad or in war plants at home.

These Monarch lathes have a long record for fast, accurate production of the widest variety of work. To produce more pieces, at less cost and effort, make Monarch your lathe choice.

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

MONARCH LATHES
Save Time

Malleable Irons find use for



Strength and toughness are the special qualities for which Malleable Iron is valued. Research is constantly employed to make these physical properties more dependable; and engineers govern their uses of Malleable Iron accordingly.

A recent advance has been the addition of Boron to the list of alloying elements. The Molybdenum Corporation, being a very large producer of Boron alloys, has developed a Ferro-Boron which dissolves readily in iron at ordinary casting temperatures, without elaborate preparation, and under standard foundry procedure.

Inquiries are invited on any use of Molybdenum, Tungsten, or Boron, and specifically on the use of Ferro-Boron for the improvement of Malleable Irons.

AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
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MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING PITTSBURGH, PA.

MCA

NEED ANY HELP...

on the PROCUREMENT of STAINLESS STEEL?

If so, RUSTLESS can help you.

The following are only a few of the factors which daily confront the purchaser of Stainless Steel:

1 • **WPB Regulations**—This demands a knowledge of CMP, Basic Regulations M21a and M126, allotment procedure, allowable end uses, scheduling and minimum quantities.

2 • **Delivery**—The buyer must know lead time—and if quick delivery is required, whether an item can be secured from mill warehouse or frozen stocks.

3 • **Alternates**—Choosing alternates often saves valuable time.

4 • **Government Inspection**—When required at mill, inspection involves specification detail, notification of buyer's proper local inspection office and a knowledge of the time consumed by inspection tests.

5 • **Fabrication**—Suggestions before ordering may eliminate a fabrication problem later. Intelligent help after delivery paves the way for smooth production.

RUSTLESS, devoted exclusively to the manufacture of Stainless Steel, is in daily contact with these and other procurement problems. Our familiarity with your difficulties enables us to give you immediate, up-to-the-minute information on your requirements. Write or wire us . . . RUSTLESS is anxious to render helpful service at all times.

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Ask Rustless By Phone. (Service 24 hours daily—7 days a week).
Call Wolfe 5400, Baltimore, Md.

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WHEN YOU WANT TO KNOW ABOUT STAINLESS

Ask

Rustless

Producing STAINLESS STEEL Exclusively

EXPENSIVE, hard-to-get tools can be put on the casualty list in a hurry when machine speed isn't right.

As the proper speed varies widely with different INCO Nickel Alloys, technical data on this important subject is assembled in the International Nickel Co. bulletin, "Machining." A representative chart from the booklet is reproduced below.

Additional charts give recommended feeds and speeds for Automatic Screw Machining, for Drilling, and for Reaming.

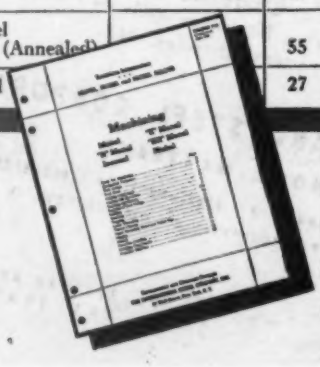
Other valuable machining pointers in the booklet are given on stock, tool design, cutting compounds, tapping, cutting-off operations, lathe threading, etc.

A copy or copies will be sent to you on request. Use the coupon below, or drop a postcard to:

THE INTERNATIONAL NICKEL COMPANY, INC.
67 WALL STREET, NEW YORK 5, N.Y.

TABLE IV
Recommended Cuts, Feeds, and Speeds for Lathe Turning Inco Products

Depth of Cut (in.)		1/32	1/16	1/8	1/16	1/8	3/16	1/16	1/8	3/16	1/4	1/4	1/4	3/16	3/16	3/16	1/2	1/2	1/2
Feed (in.)		0.008	1/64	1/32	1/64	1/32	1/16	1/64	1/32	1/16	1/32	1/16	1/8	1/32	1/16	1/8	1/32	1/16	1/8
Speed ft. per min.	Wrought Monel Wrought Nickel	168	139	118	121	104	60	110	68	48	34	57	39	29	52	34	24	49	31	21
	Wrought "K" Monel (Unhardened) Wrought Inconel	115	85	75	75	65	40	70	45	35	25	37	27	20	30	25	15	32	20	15
	Cast Nickel		110	95	95	80	55	85	60	55	35									
	Cast Monel		90	80	80	70	45	75	50	40	30									
	Cast "H" Monel Cast "S" Monel (Annealed)				55	45	30	50	35	25	20	These feeds and speeds apply to cutting with cemented carbide tools. Reduce 50% for cutting with regular high speed tools.								
	Cast "S" Monel				27	22	15	25	17	13	10									



THE INTERNATIONAL NICKEL CO., INC.
67 Wall Street, New York 5, N. Y.

Please send me ..... copies of the booklet "Machining," T-12.

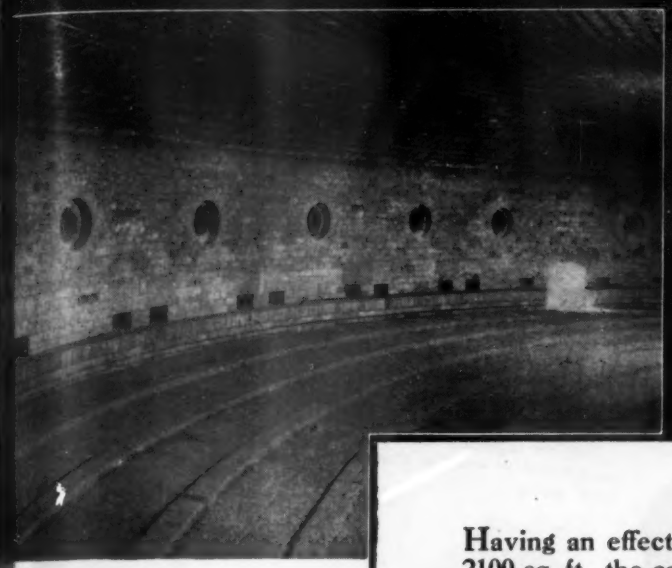
Name..... *Title*.....

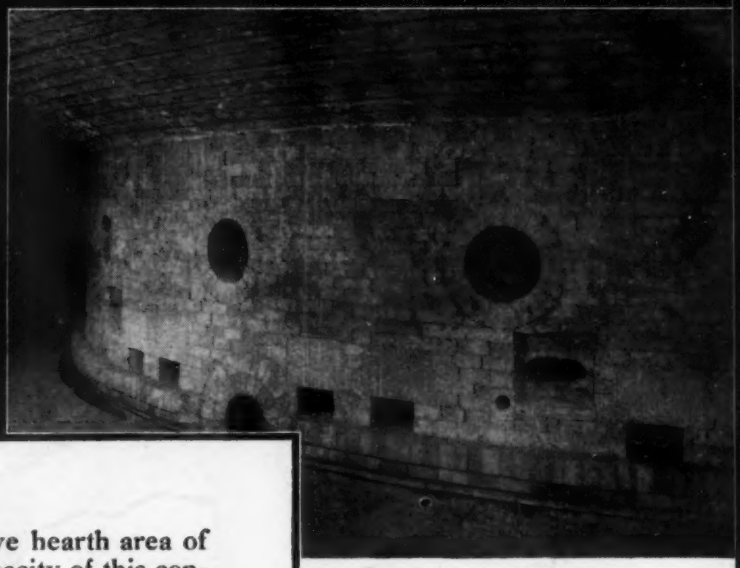
Company.....

A.M.11-25-48

Address.....

THE WORLD'S LARGEST ROTARY FURNACE BUILT BY SALEM



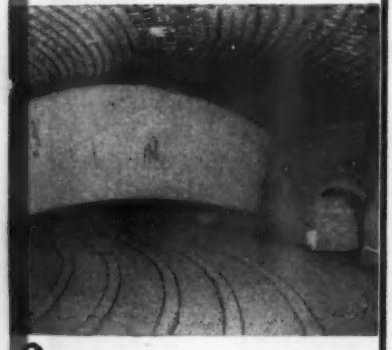


Having an effective hearth area of 2100 sq. ft., the capacity of this continuous tunnel type Salem Rotary Billet Heating Furnace is 80,000 lbs. per hour at 2250° F. when heating 10" billets on a 5 hour cycle. It is gas fired, and it is equipped for oil as a stand-by fuel. Billets ranging from 4" to 10" in diameter and from 5' to 14' in length are heated prior to piercing with a maximum scale loss of ½ of 1%. The temperature for each of the five zones in the furnace is automatically recorded and a dial chart, which revolves with the furnace, enables the operator to locate any billet during the heating period.

The hearth is equipped with variable speed mechanism which gives a range of 2 to 8 hours per revolution. A refractory type baffle between charging and discharging doors prevents cold billets, which are being charged, from having a detrimental effect on billets being discharged. For heating certain alloy steels, which require lower charging temperatures and longer heating-up cycles, a removable section of cooling pipes may be placed between the baffle and charging door. Salem will design a similar furnace, or any other type, for your specific needs.

SALEM ENGINEERING COMPANY

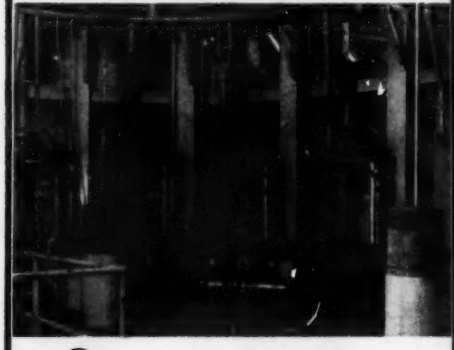
1 *The inside surface of the outside wall, showing firing and exhaust ports as well as piers of the rotating hearth on which billets rest.*



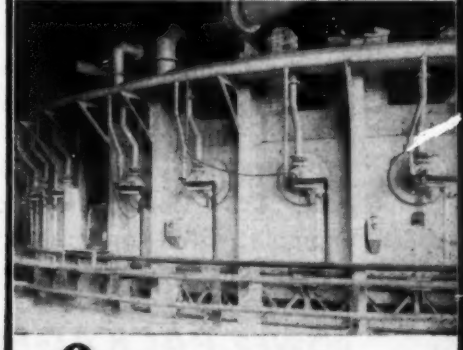
2 *The refractory type baffle between charging and discharging doors protects hot billets being discharged from harmful effects of cold billets being charged.*

3 *A special designed water-cooled skid charges and discharges billets. The hearth moves continuously or may be operated intermittently, if desired.*

4 *Additional ports on the convex surface of the inside wall. Wall to wall width is 16½ ft. Effective loading width of hearth is 14 ft.*



5 *On the inside of the "doughnut" are located burners which fire through the ports that are shown in Picture No. 4.*



6 *Burners around the perimeter of the outside wall. Each set of burners is equipped with precise temperature controls.*

SALEM ENGINEERING CO. · SALEM, OHIO

In the tight spots it's a STAR

Example: CHICAGO PUMP CO. COMMINUTORS
are equipped with
STAR MOTORIZED REDUCERS
These Star-powered comminutors are used widely here and abroad to screen and cut sewage matter automatically.
They operate 24 hours a day, 365 days a year.
They're ruggedly built to absorb mechanical or weather shocks and to keep going.

It's a simple matter for STAR to fit mechanical "tight spots". STAR does it every day with its unique welded construction that eliminates special patterns and castings completely. And it's the same with the other "tight spots," too—the unusual problems that puzzle manufacturers daily. In the **CHICAGO PUMP CO.**'s Comminutors for Sewage Plants, for example, STAR engineering provides exposed motors and reducers that withstand the extremes of arctic ice or desert sand—and do it without special or costly construction.

Besides its complete line of standard motors, STAR provides *tailored* motors which combine the flexibility of specialized application and engineering with the obvious advantage of standardized design. Sizes—½ to 200 h. p. Write us about your requirements.

STAR ELECTRIC MOTOR CO., BLOOMFIELD, N. J.

POWER PACKAGED AS YOU NEED IT

ARMY E NAVY

STAR MOTORS

JOHNSON BRONZE

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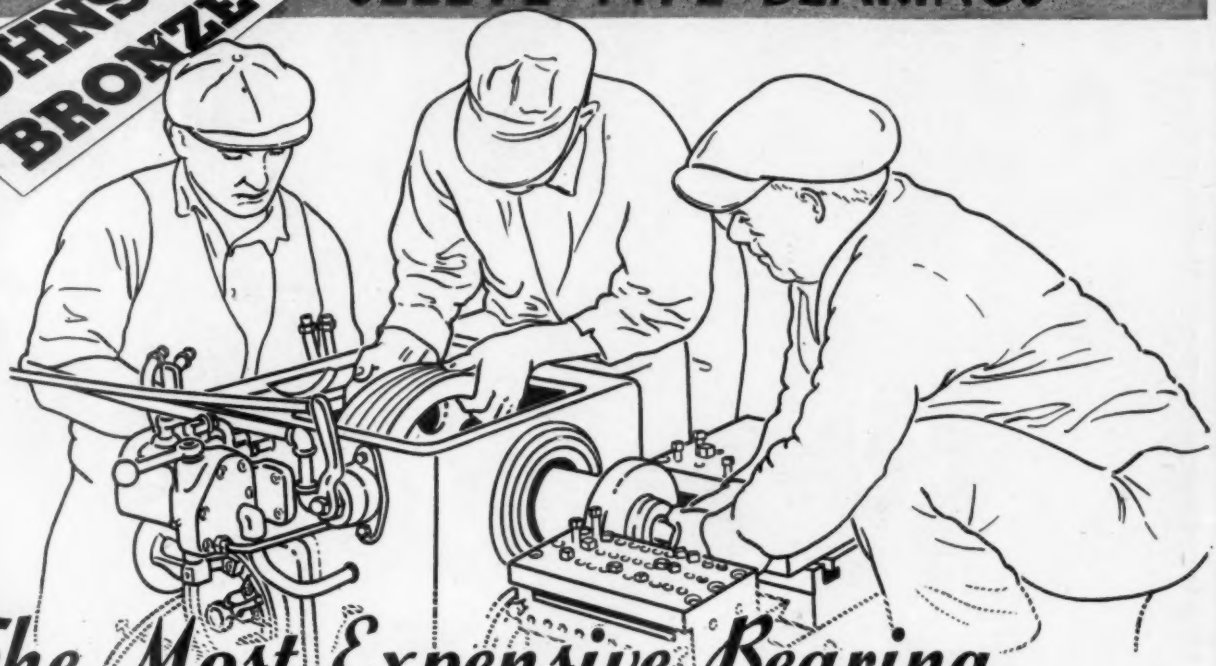

The Most Expensive Bearing

in the WORLD . . .

. . . *is the one that fails.* To determine the real price of faulty bearings take the original cost and add the expense of installation. Then include the productive time lost while the machine is down.

Most bearing failures can be prevented. Start with the highest quality sleeve bearings available. See that they are correctly installed . . . in perfect alignment. Then institute a regular schedule of lubrication with the right type of lubricant.

Johnson Bronze offers manufacturers in every type of industry the highest quality SLEEVE TYPE Bearings on the market. Johnson Sales Engineers are available at all times to give sound advice on the installation and maintenance of bearings. Real bearing values are figured in terms of performance . . . not purchase price.

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THE MOST COMPLETE SLEEVE BEARING SERVICE

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Photos Courtesy Consolidated Vultee

CONSOLIDATED VULTEE

...Cradle of the 'Liberator'...

USES 13 MOORE JIG BORERS IN THE LINE

The first two machines of this battery of thirteen entered the San Diego Consolidated plants in the late fall of 1939. In the first four months of 1941, six were added, and the following year five more joined the line. There is no better proof of jig borer satisfaction than a service record such as this, with a producer for whom performance *only* counts...performance such as: RANGE: In the boring of holes in jigs, fixtures, dies, gages and special, accurate machine parts, the Moore Jig Borer is highly sensitive for holes of 1/32″ diameter, yet rugged for heavy cuts up to 4½″. The Moore Jig Borer is fast, accurate, versatile and rugged. TOLERANCES: Consistently .0002″ and better. COORDINATE LOCATION: By the Moore system of coordinate location, attainable through lead screws ground to an accuracy never achieved before, the operator spots, drills, reams and bores in one uninterrupted sequence.

Partner in Production... The only machine tool of its kind, the Moore Jig Grinder corrects and finishes jig-bored holes on both hard and soft work within .0001″. Let us show you how the Moore Jig Borer and the Moore Jig Grinder will modernize your toolroom operations for better war...and post-war...performance.

MOORE SPECIAL TOOL COMPANY INC.

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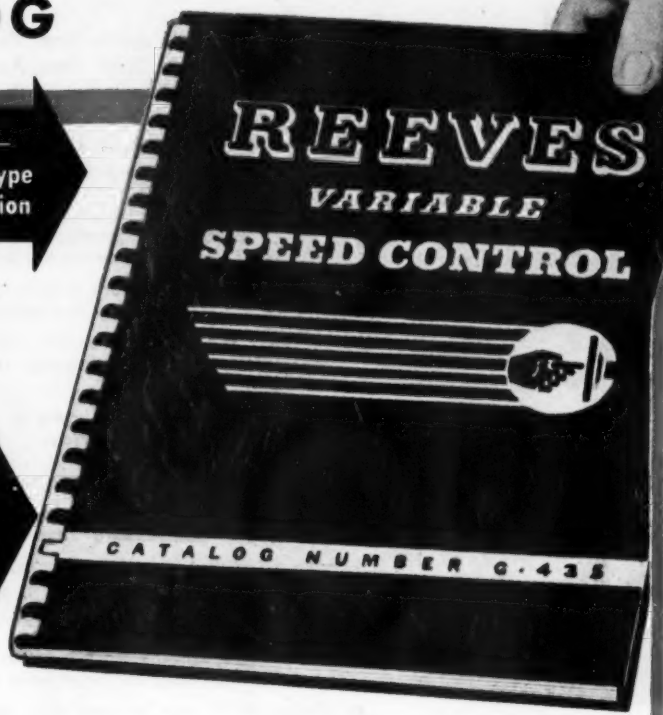
NEW, REVISED REEVES CATALOG

NEW— Reducer-Type Transmission

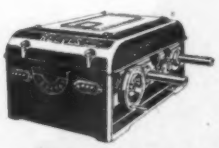
NEW— Vari-Speed Jr.

NEW— Sizes and Speed Ratios

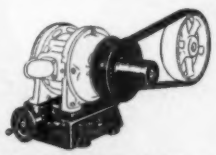
NEW— Diagrams and Tables



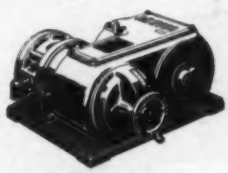
This book is more than a catalog. It is a complete, authoritative textbook on variable speed control, issued by REEVES, originators of the Variable Speed Transmission and recognized leader in the specialized field of speed control engineering. Its 128 pages are packed with practical information for manufacturers in every line of industry. This book gets right down to the fundamentals of accurate speed control—what it is—how engineered and applied—the remarkable advantages it offers. Contains over 200 illustrations, diagrams, and tables. It is written out of the experience of REEVES engineers in applying infinite speed adjustability to more than 260,000 machines in all types of plants. Regardless of what you manufacture, you will find this book valuable and helpful. Since it is being distributed only to those who request it, use coupon below.



VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over wide range.



VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive.



MOTODRIVE combines motor, speed varying mechanism and reduction gears in single compact unit.

A COMPLETE, AUTHORITATIVE TEXTBOOK ON Speed Control—

Here are a few of many features that make it important for you to have this book.

A clear, concise explanation of the necessity for variable speed control in modern manufacturing processes.

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MAIL THIS COUPON FOR YOUR COPY . . . TODAY!

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Send copy of your new, revised Catalog-Manual G-435, on Variable Speed Control.

Name..... Title.....

Company..... City..... State.....

Throughout America production PLUS is being delivered around the clock with H-W Semi-Automatic Thread Millers which produce external or internal threads, right or left hand or taper with equal facility and precision. The H-W milling method offers the advantages of multiple cutters . . . threading of all lengths within the machine's capacity in a single revolution of the work.

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- Danger of spoiled work is greatly minimized . . . highest accuracy and precision are obtained.
- Permits working of many previously hard-to-thread materials . . . maintaining accuracy, precision and speed.
- Produces right or left hand or taper threads . . . with equal facility and precision.

. . . Also H-W Taps can be depended on to take the bottlenecks out of thread production . . . delivering longer runs between grinds . . . minimizing down time . . . reducing rejects . . . These advantages are made possible by the "Hanson Process" . . . our exclusive method of finishing after hardening . . . insuring uniform grain structure from tip to shank.

- H-W Taps are invariably correct in pitch and form and can be depended on for greater accuracy.
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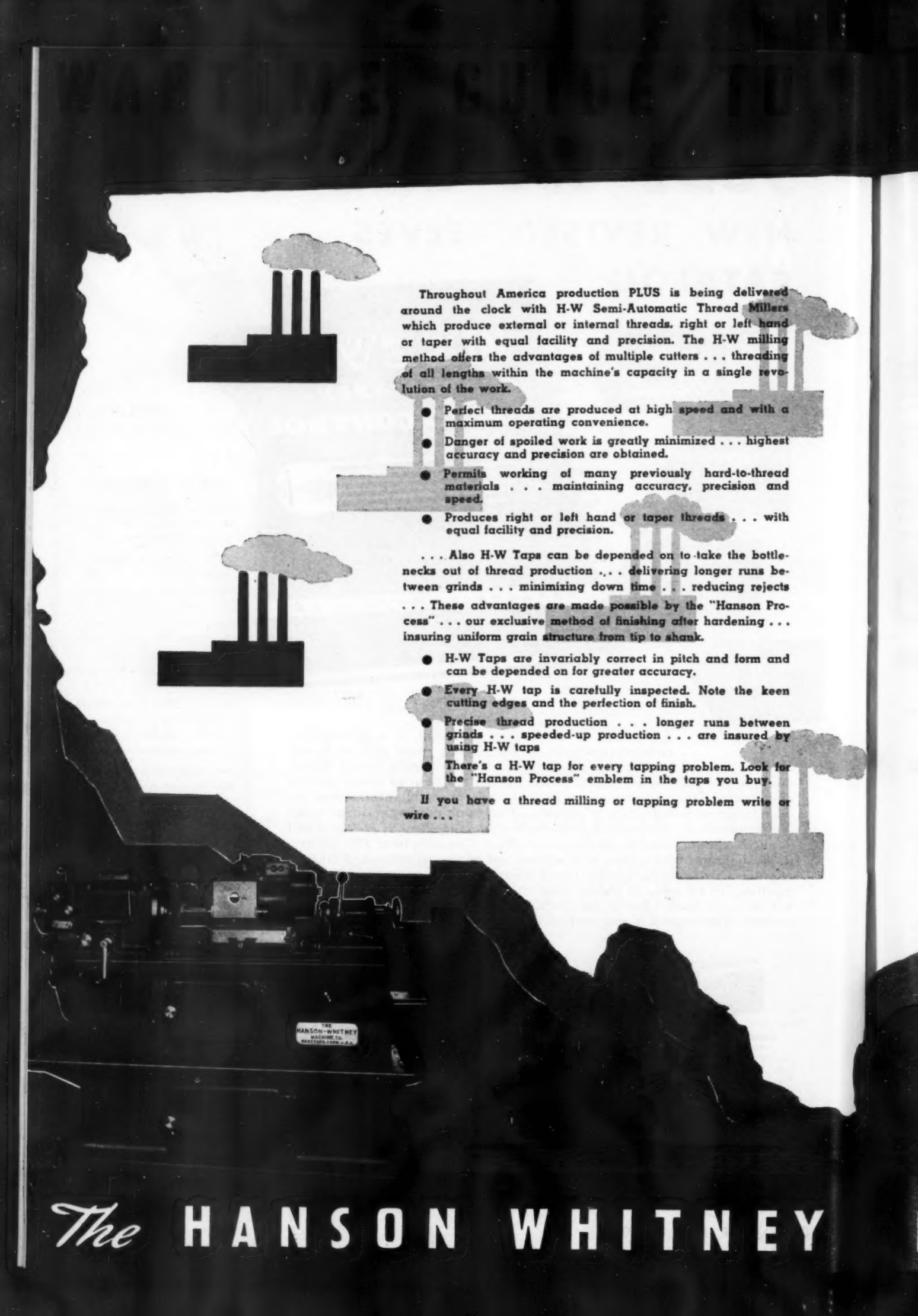
- Precise thread production . . . longer runs between grinds . . . speeded-up production . . . are insured by using H-W taps
- There's a H-W tap for every tapping problem. Look for the "Hanson Process" emblem in the taps you buy.

If you have a thread milling or tapping problem write or wire . . .



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HE'S A FLYING GUY

Who's Flying High

This man was at Pearl Harbor. That day he never got his plane off the ground. A bomb got it first.

He fought against great odds for the next year or two. One plane against three . . . ten against forty. And he did all right, too

Today those odds against him have been greatly reduced as planes in ever-mounting thousands roll off America's production lines. Acme men and women are happy that they've made some contribution to the plane this man flies and to the equipment he's got.

They are proud of the part they are playing in producing for victory, because whether it's patterns, dies, heat-treated aluminum castings, or specially engineered tools needed by war plants, Acme production is keyed to the slogan "Acme for Action."

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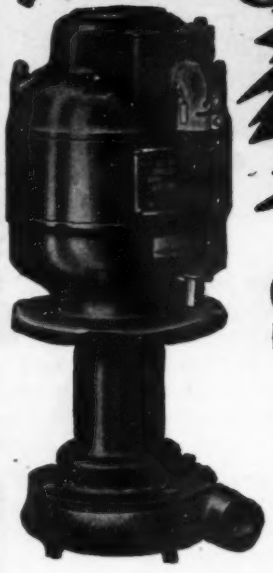
Heat-Treated Aluminum Castings—Patterns—Tools—Tool Designing—Production Processing

For VICTORY buy WAR BONDS and STAMPS — ARMY E NAVY

Reduce WEAR AND TEAR on Tools



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A copious flow of coolant saves your tools and speeds production. Gusher Vertical Centrifugal Coolant Pumps are dependable and efficient. They handle chips and grit. Other outstanding advantages. There's a type and model for your needs. *Write*

Model 9040 — Equipped with integral flange bracket for reservoir cover or bed-plate mounting. Designed for installation interchangeability with Gusher Model 1-P3. Available in any current characteristics, including 25 cycle, 1, 2, or 3 phase. Totally enclosed ¼ h.p. motor. Two lengths (from flange) 6-7/16" and 8-7/16". Available in ½" or ¾" pipe size discharge.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

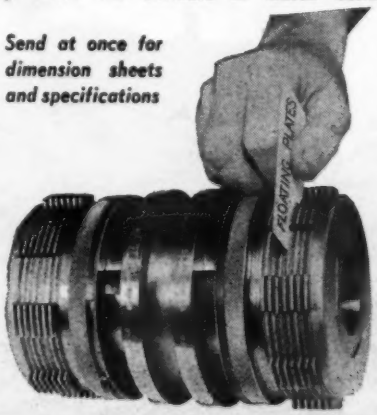
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

Single

THE NEW "MAXITORQ" IS IDEAL FOR MACHINE TOOL APPLICATIONS

"MAXITORQ" FLOATING TYPE MULTI-DISC CLUTCHES are recommended for power transmission applications where smooth engagement, quietness, cool running without drag and quick, positive disengagement are required. They are especially adaptable to machine tool use and other types of industrial machinery where the ultimate in clutch action is of paramount importance.

Send at once for dimension sheets and specifications



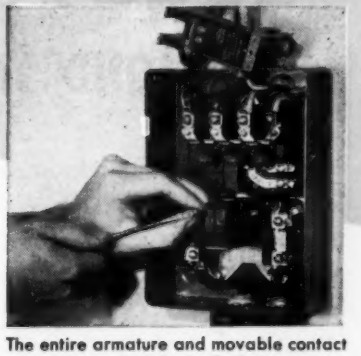
Features include floating discs which assure minimum drag, easy manual assembly and quick easy adjustment. They are compact, simple and require minimum attention. Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 114 OR CONSULT SWEET'S OR THOMAS' REG.

THE JOHNSON FRICTION CLUTCH

Here's a Starter You Can Really Get At!

Loosen two screws and the arc chamber cover comes off. You can inspect every contact surface at a glance.



The entire armature and movable contact assembly can be lifted off after two more screws come out. You can easily slip off the magnet coil after disconnecting two wires from its screw type terminals.

Contacts are attached with separate screws—you can remove or replace them without disturbing any wiring—and a screw driver is all you need.

Peak operating efficiency and long life of electric motor starting equipment depend largely upon regular inspection and occasional servicing. Today, with every minute at a premium, this inspection and servicing job is more important than ever.

The complete accessibility of Square D starters means faster, easier inspection and servicing. Their simple construction enables the electrician to exchange magnet coils, contacts or overload relays in practically no time at all—using only a screw driver.

Write for Catalog Bulletin 8536 which describes Square D's complete line of A.C. magnetic starters. The starter illustrated is Size I for 3 phase motors up to 5 HP. at 220 volts or 7½ HP. at 440 volts. One smaller, and three larger sizes are also available.

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DIAMOND WHEELS

When the war is won—Americans will enjoy higher standards of living than ever before. Motor cars, airplanes, trucks and tractors, home appliances, every machine and tool that's made of metal, will be better, safer and stronger. JKS Diamond Wheels will help to make this possible by processing tougher metals, with greater precision. Far-sighted companies are already designing new products, scanning new outlets and perfecting plans for cutting their costs with improved machine tools. To such executives this is an invitation to write today to—

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DUAL PURPOSE PUMPS — 2 SYSTEMS from ONE UNIT

Brown & Sharpe Design Simplifies such Adaptions

A single unit which serves two functions is an essential requirement for many installations. Pump below delivers approximately 37 gals. per min. at 35 lbs. pressure for each of the lubricating and scavenging systems of a Diesel engine. Catalog listing complete pump line sent upon request. Brown & Sharpe Mfg. Co., Providence, R. I., U.S.A.

GEARED — VANE — CENTRIFUGAL — MOTOR DRIVEN

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BROWN & SHARPE PUMPS

Amazing S-22 Synthetic
ETCHING STAMPS

Thousands of our new "S-22" Synthetic stamps now in service have proved that this new material outlasts rubber or other synthetics by from 3 to 4 times, when used with acid etching inks. Order "S-22" next time you need inspection stamps.

INSPECTOR'S KIT

Made of acid proof, non-critical material, this new Kit holds stamps, etching ink, ink pad and neutralizer. Inexpensive, compact and convenient. Write for quotation.

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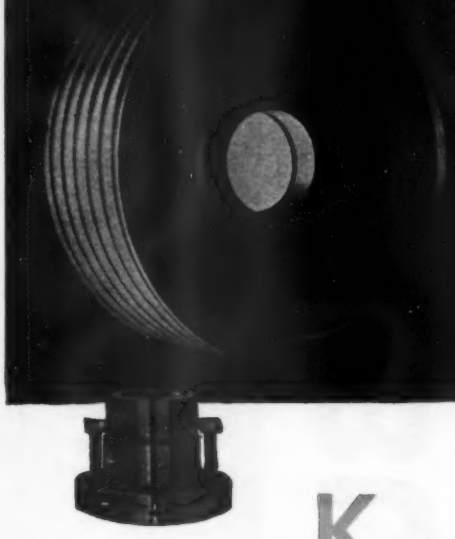
SAVE TIME-SAVE MAN POWER

that's what they're doing today with

QD SHEAVES



Key men in War Industries who are responsible for transforming blue prints into products in the *shortest time* with a *minimum of man power* are specifying the QD Sheave as an integral part of their Multi-V-Drives for the DriveR and DriveN unit.

The Worthington Engineered QD Sheave has contributed more than any other item in the development of the V-Belt Drive toward conserving vital equipment, energy and time.

Investigate the many advantages of the QD Sheave... it will help you to maintain maximum operating efficiency, with little or no time out for maintenance repairs.

Dealers everywhere are demonstrating to their customers the time-saving, labor-saving and material-saving advantages of the QD (Quick Detachable) SHEAVE. Ask for a demonstration or write for new Bulletin V-1400-B7.

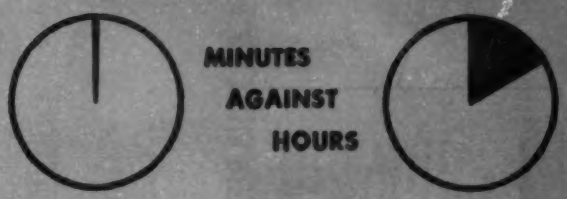
Specify the QD Sheave for your next requirement!

QD MEANS QUICK DETACHABLE **SHEAVES**

MULTI-V-DRIVE

MV3-14

CONSERVE TIME



The patented QD Sheave design makes mounting or removing possible in sixty seconds—at the same time assures a positive press fit assembly to the shaft. This cuts hours off maintenance repair time, formerly required to remove the old type sheave—a factor that will yield maximum productive machine hours.

CONSERVE MANPOWER

A MAN AND A WRENCH . . . NOT SEVERAL MEN AND MUCH MAINTENANCE EQUIPMENT.

No special tools are required to remove or install a QD Sheave, regardless of size.

One man and a wrench will do the job—a tremendous advantage today when everyone's productive responsibilities are multiplied... and miscellaneous maintenance machinery is always in constant demand.

CONSERVE EQUIPMENT

Cracked sheaves, scored or bent shafts, burnt bearings, etc., resulting from removing the old type sheave with sledges, crow bars, wheel pullers, etc., have been definitely eliminated with the QD Sheave.

MULTIPLE V BELT DRIVE

WORTHINGTON MULTI-V-DRIVES

COMPLETE DRIVES — SHEAVES OR BELTS ONLY

WORTHINGTON PUMP & MACHINERY CORPORATION • GENERAL OFFICES: HARRISON, N. J.

THE NEXT ADVANCE IN MACHINE TOOL DESIGN

NOW AVAILABLE TO MANUFACTURERS . . .

The basic mechanism of the LINK-BELT P. I. V. Gear Speed Variator is now supplied — without housing — for integral mounting with the change gears in any machine tool. Outstanding advantages result for both builder and user.

COMPACT

Space is Saved, Construction is Simplified — Lubrication is Unified — a more COMPLETE Machine results.

INFINITE SPEED CONTROL IS ESSENTIAL to

Modern Standards of Manufacture

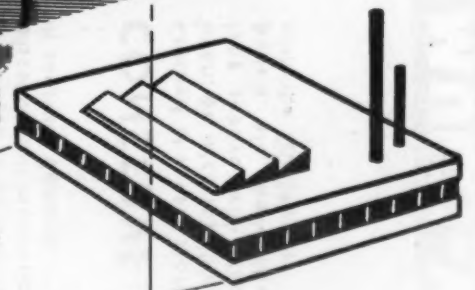
To Secure — — —

CORRECT CUTTING SPEED
SUPERIOR FINISH
MAXIMUM PRODUCTION

BUILT-IN

Positive, Infinitely Variable

Speed Control



ENGINEERING SERVICE AT YOUR DISPOSAL

LINK-BELT Engineers will give all possible aid to machine tool builders to secure the most efficient arrangement of P. I. V. Gear mechanism in relation to change gears and drive. Consult with them — freely—for best results. Send for P. I. V. Data Book 1874.

LINK-BELT COMPANY
PHILADELPHIA 40, PA.

LINK-BELT

P. I. V. GEAR

INTEGRAL VARIABLE SPEED CHANGER

Protect Dead Centers with DIXON'S

LATHE CENTER
GRAPHITE LUBRICANT

AND SPEED THE JOB

Read what experienced machine shops write:

"Eliminates burning entirely"

•

"Am enabled to use centers indefinitely"

•

"Can increase speeds without undue heating"

DIXON'S Lathe Center Graphite Lubricant is made especially to lubricate dead centers of lathes. It provides effective protection against overheating, softening and scoring. Increases production by permitting heavier cuts and higher speeds. Promotes accuracy by permitting tighter set-up.

Use it also for steady rests, jack screws and other applications where a lubricant of extreme film strength is required.

IN HANDY TUBES
Easy to Apply

1, 4 and 8-oz. at your regular supplier or write for printed RLC69.

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, N. J.

I would like to try Dixon's Lathe Center Graphite Lubricant. My supply houses are:

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NAME _____

ADDRESS _____ 69.

KEEP YOUR GRINDING WHEELS ACCURATE AS THE GUNS THEY HELP TO PRODUCE!

with

VINCENT - HUNTINGTON

NEW IMPROVED

GRINDING WHEEL DRESSERS and CUTTERS

• Grinding wheels, to operate at top production grinding efficiency, must be properly dressed and trued! The regular use of VINCENT - HUNTINGTON New Improved Grinding Wheel Dressers and Cutters will accomplish this vital job . . . save your grinding wheels . . . aid you in speeding War-time grinding operations.

In addition to making Grinding Wheel Dressers and Cutters, we also operate two of the largest production heat-treating plants in the United States. These two plants are working 24 hours a day — 7 days a week, and turn out approximately 300 tons of war work daily.

"If it's a Huntington Dresser or Cutter — Vincent Makes It."

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THE VINCENT STEEL PROCESS CO.

GEARS... GUNS... AND MEN!

Today's victories of our armed forces are the result of their superior fire power on land and sea . . . and in the air — a superiority attained by design engineers working in conjunction with the army and navy ordnance departments. Victory and success depend on gun calibre and range . . . also its maneuverability and the clock-like precision of the firing mechanisms. . . . D.O.James precision-made gears are important controlling factors in attaining the maximum fire power and efficiency of many of the guns now being so successfully used by our armed forces. . . . Accurately conforming to these design requirements has been an every-day "must" in our organization for over 55 years in the design, engineering and manufacture of all types of gears and gear speed reducers.

D.O.James

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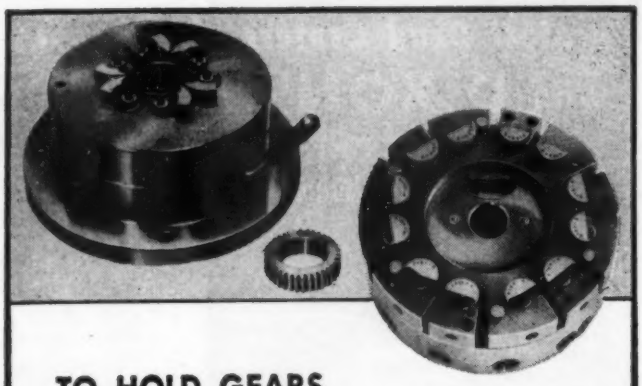

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with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in

MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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FOR SIXTY YEARS

Spur—SPEED REDUCERS—Worm
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New Design
New Features
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IT TAKES GOOD GEARS TO MAKE GREAT GUNS

PRECISION GRINDING A PHILADELPHIA WORM

To turn out the ordnance material that is helping push back the Axis forces on every battlefront American industry needs vast numbers of gears.

Logically we have been called upon to produce many of them.

For more than half a century, Philadelphia Gear Works has been specializing in the manufacture of all types of gears, in all industrial sizes.

This long experience, plus our extensive facilities and well trained gear craftsman may be the answer to filling your gear requirements.

Why not talk it over with us?

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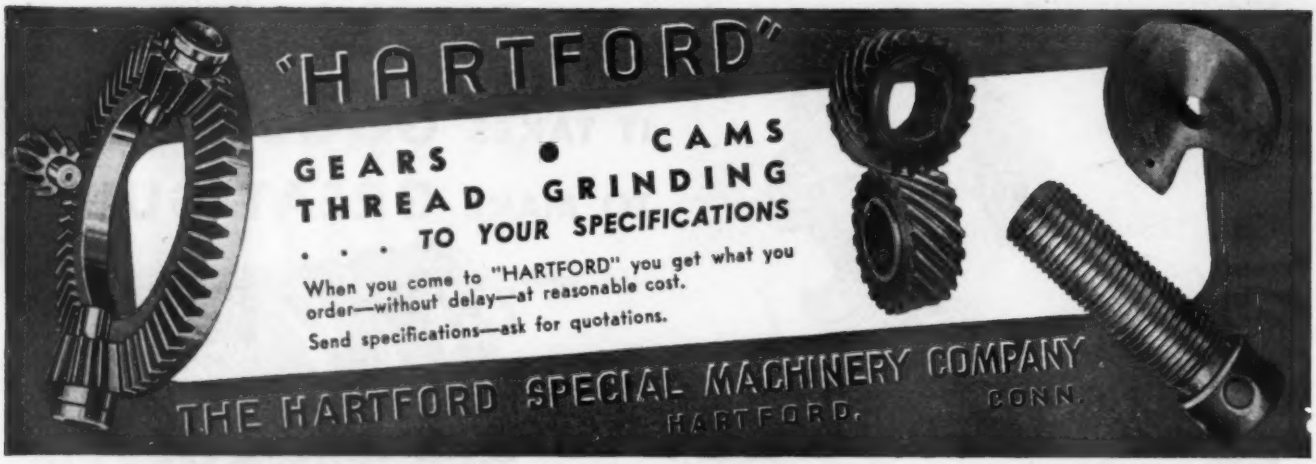
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. . . TO YOUR SPECIFICATIONS
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WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

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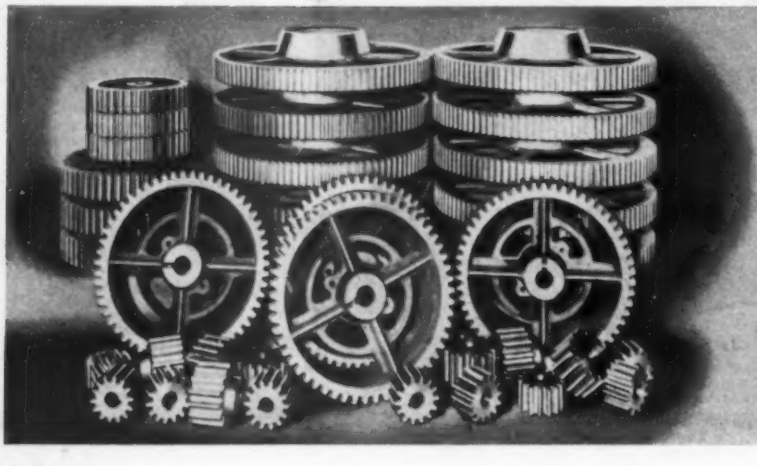
"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears —Reduction Units—Why not try GRANT.
You will find GRANT service meeting all requirements on both stock and special gears."
GRANT GEAR WORKS
BOSTON



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SPUR — HELICAL — WORM
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Splined Shafts A Specialty

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Accuracy of smaller sizes extends through a complete size range

Sier-Bath is prepared to make prompt shipment on gears of all types in sizes from 2" to 52" diameter. Send your specifications for a time and cost estimate.

This large diameter bull ring forging is constantly checked for accuracy during machining operations on a big vertical turret lathe. It must pass a rigid close tolerance inspection before teeth are cut. Precision at every step in production, regardless of gear size, is an inflexible rule in the modern, Sier-Bath shop, so that from start to finish gear accuracy is definitely assured.

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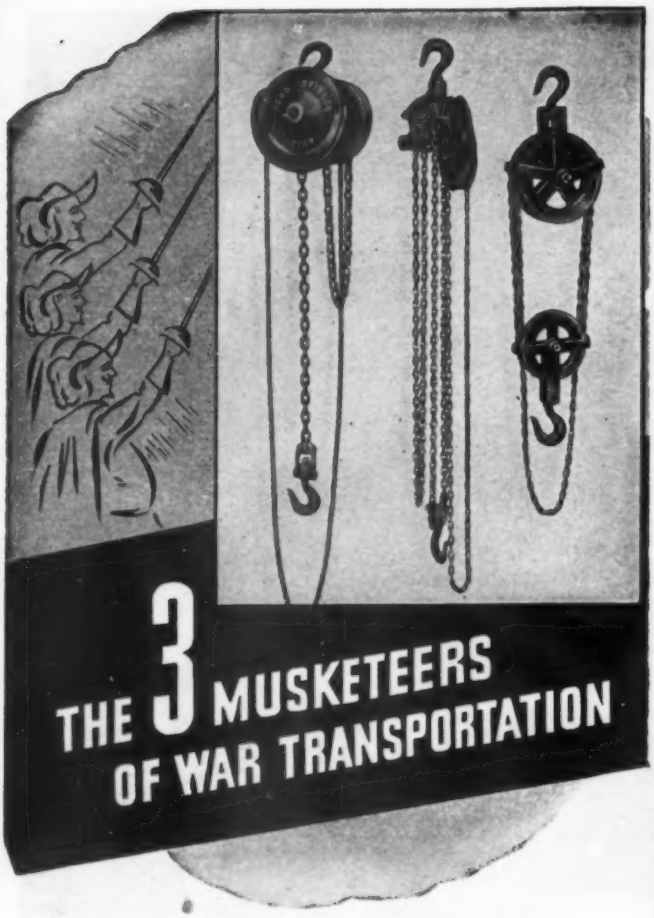
The Doorway to 38 years experience in making Precision Gears



THE 3 MUSKETEERS OF WAR TRANSPORTATION

FORD CHAIN BLOCKS are sturdy mechanical soldiers, and as such deserve the consideration given *all* soldiers. They should not be weakened by overload; they should have their regular ration of lubrication. Here are a few suggestions for keeping your **FORD CHAIN BLOCKS** on constant efficient duty:

- Keep equipment clean, well-lubricated and in good order.
- Don't exceed rated capacity.
- Inspect chain periodically and lubricate load chain regularly.
- Don't make lifts or pulls for which the hoist was not designed or intended.
- Don't bang the hoist around or permit the chain to foul with the load.
- Replace hooks when showing signs of distortion from overloading.
- Be sure the hoist has the characteristics and capacity necessary for the job.

Write for information on **FORD TRIBLOCS.** They range in capacities from ¼ to 40 tons. Available to all who have adequate priority rating.

Order from Your Distributor

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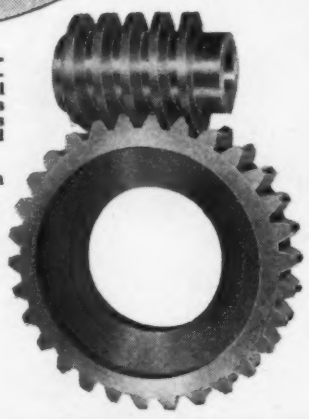
PITCH...To Us MEANS PRECISE and ACCURATE Control HELD... ...WITHIN .0002

CLOSE tolerance requirements in ordnance, instruments, aircraft and industrial materiel is one of the reasons for the tremendous demands for Cincinnati . . . Gears, Good Gears Only.

Yes, Cincinnati Gears mean definitely faster handling in assembly . . . They're "Right For The Job", because they are made specifically for each particular purpose.

We welcome an opportunity to work with you on any of your Gear Problems.



THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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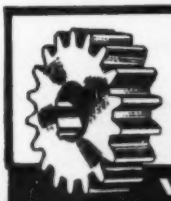

GEARED FOR VICTORY
Bevel-Spur-Worm-Helical
THE TAYLOR MACHINE COMPANY
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"TAYLOR - MADE"

Let's
BACK THE ATTACK
***By Buying* WAR BONDS**

SPECIALISTS... not jacks of all trades!

To do one thing *perfectly* rather than many things well is the sole objective of every MEISEL gear. And being constructed with only the requirements of a specific job in mind, MEISEL gears function at maximum efficiency always. Whatever your gear problem, investigate the advantages of *specifically* engineered gear by MEISEL.

MEISEL PRESS MFG. CO.
946 Dorchester Avenue Boston, Mass.

out of a Clear Sky

Invisible to the naked eye, and beyond the reach of anti-aircraft fire, Allied bombers are raining destruction on the enemy. To lift a bomber to an altitude of between 30,000 to 40,000 feet, the use of superchargers is an absolute necessity.

A vital part of every supercharger is a Perkins precision-engineered worm gear. The production of these gears to government specifications entails an exceptionally high degree of engineering "know-how." Perkins craftsmen, schooled for many years in the mass production of precision, custom-cut gears, take such assignments in their stride—today for the hard-hitting punch of our armed forces—tomorrow for the conveniences of an improved standard of living.

PERKINS PRECISION, CUSTOM-CUT GEARS

PERKINS MAKES:

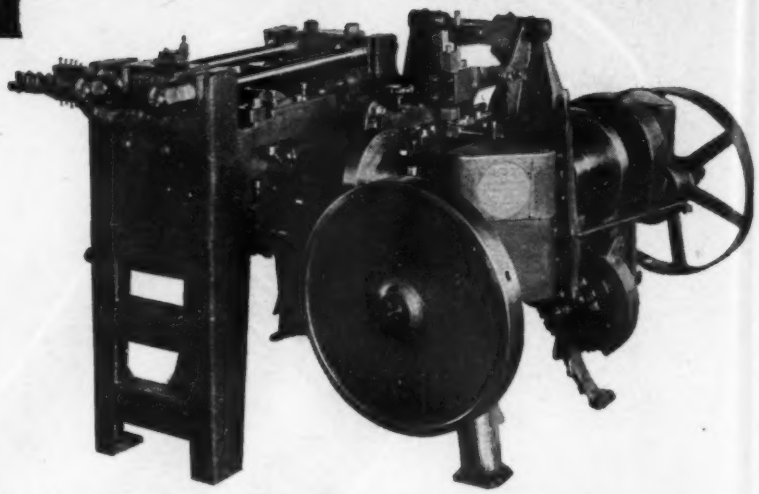
Helical Gears *Bevel Gears* *Ratchets*
Worm Gears *Spiral Gears* *Spur Gears*
Ground Thread Worms

PERKINS MACHINE & GEAR COMPANY, SPRINGFIELD 2, MASS.

The New NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES

for swaging, stamping, piercing, blanking, forming of coiled metal

These new machines built in two models—for general purpose, heavy duty fabricating metal forming—provides a capacity far beyond what is practical to accomplish with ordinary cam motion. The new NILSON is a combination power press and four slide machine with powerful silent action of main press slide operated by crank motion through toggle or knuckle joints. Great strength and rigidity are inherent in this machine. Die sets are readily accessible and easily removable. No obstruction to view is offered and tools can be adjusted without interference.



These machines are built in 2 sizes—for forming from 3/16" and ¼" diameter wire and for flat material 2" and 2½" wide. Send for 4-page bulletin giving complete details.

As specialists in the design and construction of special automatic machinery of all kinds, we are in position to render a complete service on this class of work. Consult Nilson on your special requirements.

THE A. H. NILSON MACHINE CO... Bridgeport, Conn., U.S.A.

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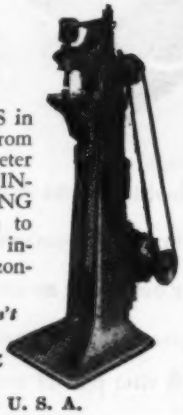

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

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BAUMBACH
STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST
46 Styles—195,000 Sizes
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Machined Steel Semi-Steel
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AUTOMATIC EQUIPMENT
THE V&O Press Co.
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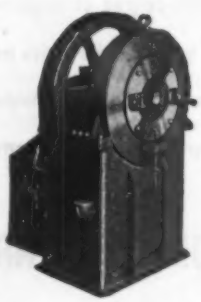

THE
TORRINGTON
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SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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ACCURATE

No. 130

THE READY TOOL CO.
IRANISTAN & R. R. AVES.,
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On straight, spiral, or taper work because the ball and socket sliding member eliminates all lost motion.

BUY UNITED STATES WAR BONDS AND STAMPS

MORE PRODUCTION PER MAN HOUR

These smaller size Niagara Inclinable Presses offer the same design features of larger Niagara Models. The instant acting 14-point sleeve clutch is an important factor in increasing the output per man hour. It is possible that one or more of these presses can help you in speeding up production of urgently needed wartime material.

NIAGARA MACHINE & TOOL WORKS
BUFFALO, N. Y.
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● BUY UNITED STATES WAR BONDS AND STAMPS ●

ROYERSFORD-EXCELSIOR

POWER HACK SAW NO. M2A

Saves Time — Saves Blades

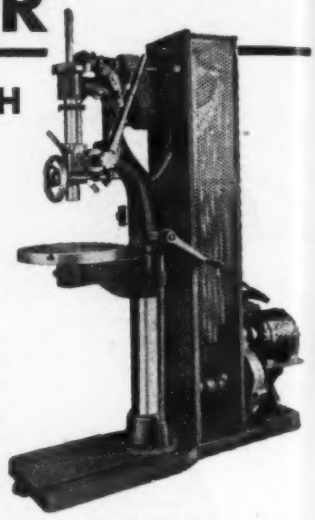
The economy of this machine — in operating time and cost — is in large measure due to the provision made to minimize blade buckling and breakage. These advantages are attained by automatically lifting blade on return stroke and placing it in contact with work on cutting stroke. Gravity feed and automatic stopping of saw on backward stroke contribute also to protect against blade breakage.

Drive from motor is through milled gears to assure more power and faster cutting.

Cutting capacity 6"x6".

IMPROVED 21-INCH UPRIGHT POWER DRILL

Fast and Accurate, Simple and Sturdy



Every modern convenience for fast precision drilling and easy handling is provided in this Royersford-Excelsior motor driven back-geared drill. It combines simplicity and operating speed with strength and rigidity and can be depended on to drill up to its 1½" in capacity with utmost accuracy.

Gears are machine cut — bearings large and powerful — change from a plain drill to a back-geared drill can be made instantly by merely sliding the gears — spindle is provided with ball thrust bearings top and bottom, counter balanced, and has automatic stop with quick return — table has quick action screw for raising and lowering.

Diameter of table 18"; spindle traverse 9"; spindle to table 29".

Full detailed specifications on these machines available promptly on request.

ROYERSFORD FOUNDRY & MACHINE COMPANY, Inc.

ROYERSFORD, PENNA.

PRODUCTO DIE SETS

ARE TOPS ON THE PRODUCTION FRONT

TOPS is the Word for Producto Service on Die Sets and Die Makers' Accessories from Bridgeport, Detroit, Cleveland and Los Angeles.

Enlarged facilities at the above assembly plants assure prompt shipment today on catalog items.

Special Die Sets can be shipped without delay from Bridgeport or Detroit.

THE PRODUCTO MACHINE COMPANY

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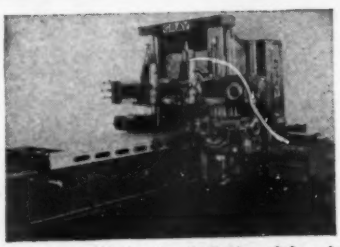
THE GRAY LINE



PLANERS

MILLING PLANERS

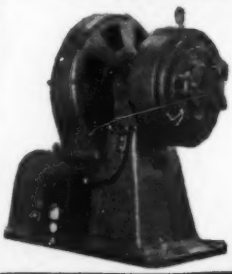
MILLING MACHINES
(Planer Type)

HORIZONTAL BORING MACHINES
(Floor Type)

Write for bulletins giving detailed specifications

The G. A. GRAY CO.
CINCINNATI, OHIO

"Ask ETNA about Swaging"



● If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

The ETNA MACHINE Co.
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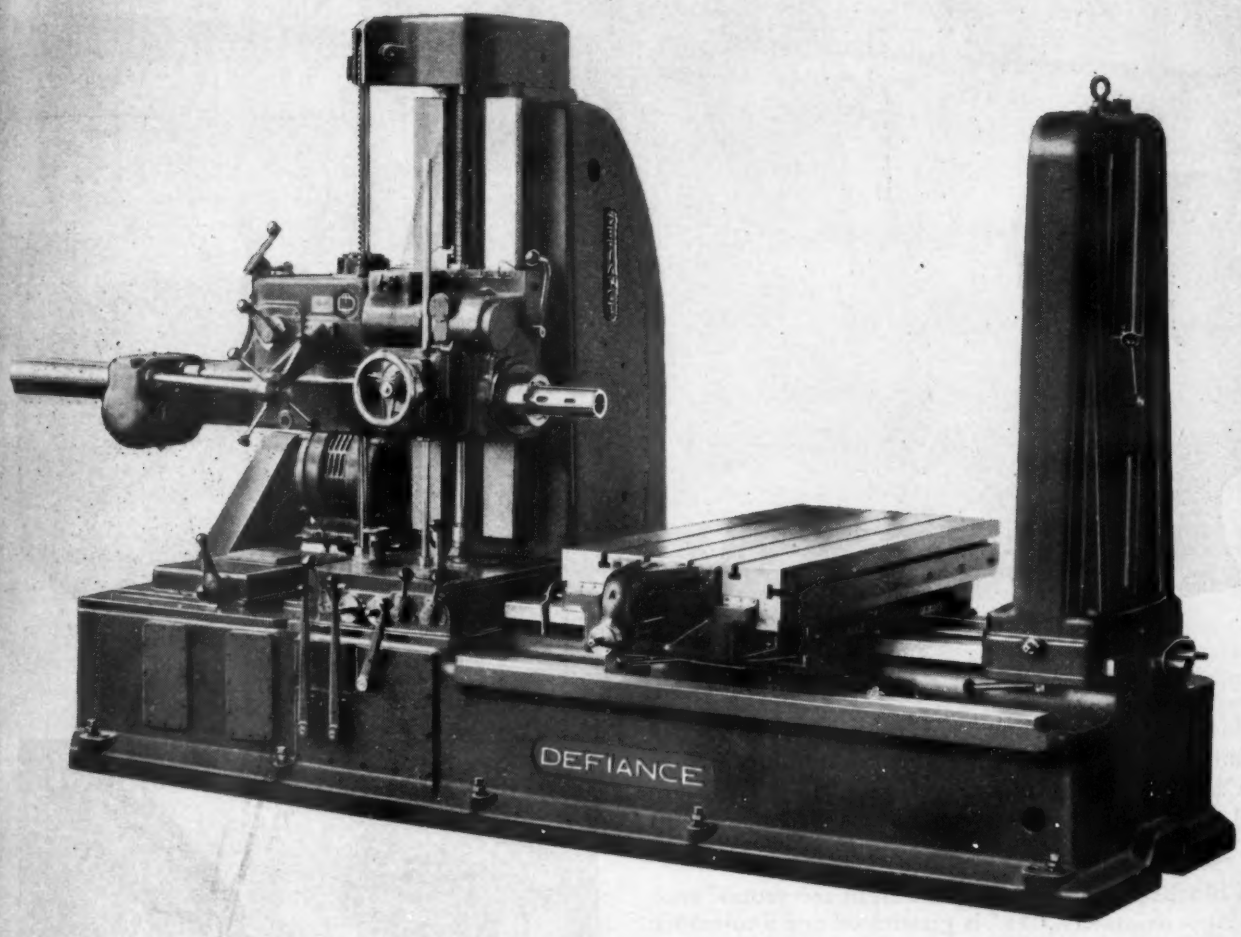
DEFIANCE



DEFIANCE stands for Accuracy . . . appreciated today more than ever on America's "production front"... where Defiance Mills are helping plants beat tough production schedules with *speed* and *accuracy*.

Defiance Machine Works, Inc., Defiance, Ohio

Makers of Precision Machinery Since 1850

ARMY E NAVY

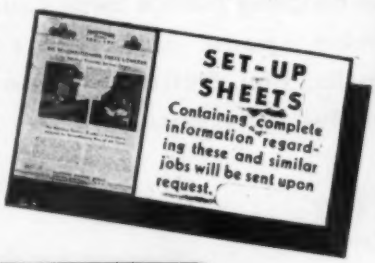
MATTISON GRINDERS IN PRODUCTION

on Breech Rings and Breech Blocks

The illustration above shows a Mattison High-Powered Precision Surface Grinder in production on breech rings for a Canadian war production plant. These rings are ground 5 sides and must be held to close limits and square with the bore.

Breech blocks in illustration to the right are ground four sides. Approximately .015″ is ground off and a tolerance of .002″ is allowed, but they are actually ground to size much closer than that.

Mattison Surface Grinders are constructed to an unusually high degree of accuracy and sturdiness which permit the profitable production of precision work at a high output rate. For further information, regarding the grinding of war jobs, ask us to send you free set-up sheets with complete information.

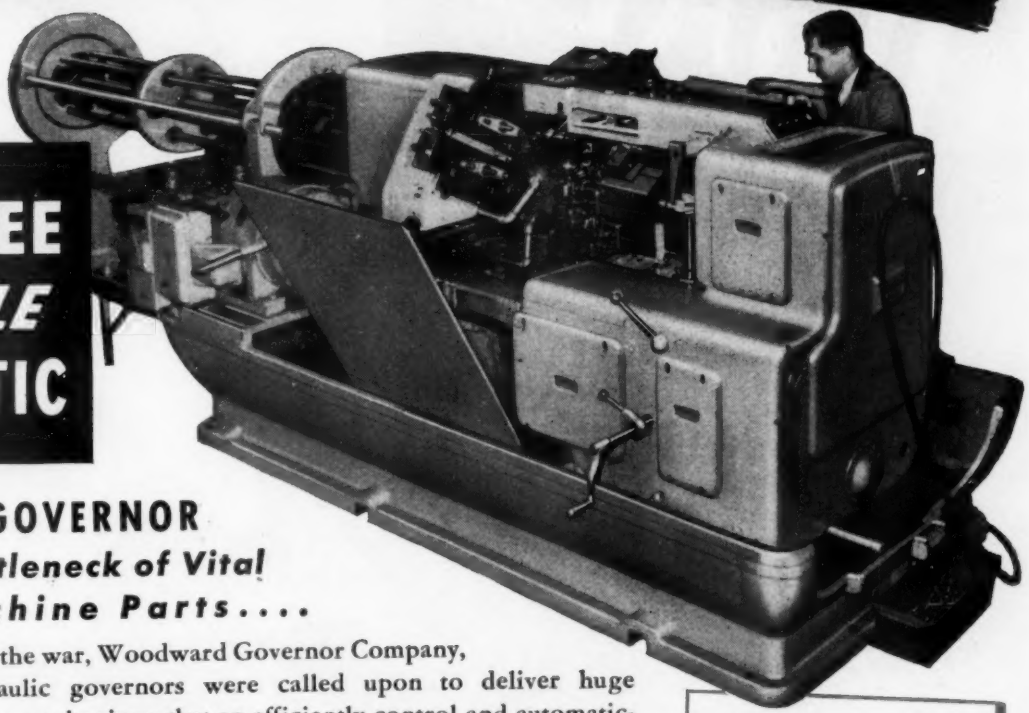


MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

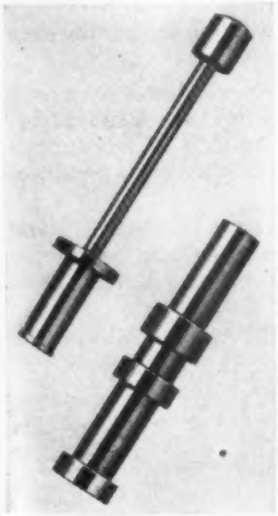
One-Run Efficiency!

WITH GREENLEE 6 SPINDLE AUTOMATIC



WOODWARD GOVERNOR
Eliminates Bottleneck of Vital Screw Machine Parts....

★ In the early phase of the war, Woodward Governor Company, manufacturers of hydraulic governors were called upon to deliver huge quantities of the intricate mechanisms that so efficiently control and automatically synchronize the performance of aircraft and marine engines. Many obstacles in production had to be rapidly overcome. Speed and accuracy were vital factors. Among the production problems were several important screw machine parts, two of which are shown below. Here are the brief facts on how a Greenlee Six-Spindle Automatic was applied to improve quality and increase production . . . a typical example of one-run efficiency.



PRODUCTION RATE—140 Per Hr. Completed in One Run

★ This high-pressure valve was formerly blanked out at a rate of 30 pieces per hour—then completed on a turret lathe at a rate of 15 pieces per hour. With the job set up on the Greenlee, the 2nd run was eliminated and the hourly production rate was stepped up 9 times. Two large outside diameters at the end and a small diameter of 5/32″ x 2″ long, normally present a difficult screw machine operation, but the flexibility of the Greenlee, permitting a wide variety of setups, efficiently handled the job.

PRODUCTION RATE—115 Per Hr. Completed in One Run

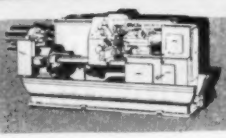
★ This part, known as a double capacity pilot valve, also required two operations before it was put on the Greenlee. The first operation was handled at the rate of 12 pieces per hour, and the second, on a lathe at the rate of 15 per hour. On the Greenlee, both operations were handled in one run and at a rate that was more than 7 times faster.

★ These facts and figures, contributed by Woodward Governor Company, speak highly of the efficiency of Greenlee Automatics, and indicate the apparent advantages of single-run operations on one machine. Perhaps they may suggest to other war plants ways and means of improving production facilities. Additional data, as well as production estimates, will be sent gladly. GREENLEE BROS. & CO., 1744 Mason Avenue Rockford, Illinois.

All Greenlee Users are invited to contribute data on practical methods considered of outstanding value in war production, for possible use in future publications.

ARMY E NAVY

BUILDERS OF THE FAMOUS MULTI-STATION AUTOMATIC TRANSFER MACHINE FOR MASS PRODUCTION OF AIRCRAFT CYLINDER HEADS

GREENLEE  *Automatic Screw Machines*

DoALL BAND FILER

Cuts all the time NO STOP —NO DRAG

SPEEDMASTER 100% variable control fits file speed to work at any point between 50 and 250 feet per minute.

DoALL Band Filer, is a complete, self-contained unit—delivered ready for immediate service.

Band filing, like band sawing, is *continuous*—without stop and drag back. *All* of the action is *cutting* action, because the file teeth move only in cutting direction.

The resultant speed is amazing! Four times faster than reciprocal machine filing—nine times faster than hand filing! *Plus* smooth cut internal or external finishes, *file-broached* to tolerances beyond .001"—precision without experience, without fatigue.

Investigate the tremendous advantages of DoALL Band Filing in production, tooling and maintenance work—on all metals, wood, fibre and plastics. There is a DoALL Sales Office near you—telephone now!

FREE: The services of the DoALL File Engineering Laboratory—bring or send your filing problem.

DoALL **BAND FILER** *Made by* CONTINENTAL MACHINES, INC. *Address Inquiries to* 1301 S. Washington Ave., Minneapolis 4, Minn.

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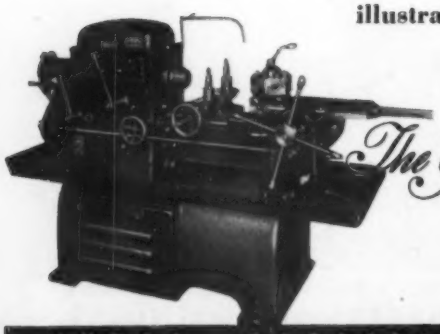
INDUSTRY'S NEW SET OF TOOLS SOLD AND SERVICED BY 34 DoALL OFFICES

Cutters? SURE!
Cal Cutters are made in many standard and special types and sizes for high speed milling of aluminum and dural castings and forgings, brass, bronze, cast iron, steel, etc. Cal-Cutters operate long periods without sharpening, save unnecessary down-time, produce superior finishes, and cost less than high-speed steel tools on cost-per-piece basis!
Write for our free catalog A showing partial list of Cal-Cutter designs. Quotations gladly furnished on special tools built to your design.
Cal Cutters
MACHINERY MANUFACTURING COMPANY
1915 EAST 51st STREET • LOS ANGELES 11, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

A bank of 9 Diehl Turret Lathes on one of the production lines in the Stewart-Warner Plant at Indianapolis, Indiana.

"One of the Fastest Production Lines in our Plant" *says B. T. Costello, tool coordinator of Stewart-Warner . . . . . .*

In many U. S. war plants you'll find the Diehl Turret Lathe on the fast production lines of war equipment. Either in a bank of themselves, like the above photo, or alongside other No. 2 lathes of standard make, using same tooling, including collets. Embodying the most advanced developments, the Diehl Lathe is unsurpassed for sustained, high speed, precision performance. Put Diehl on your production line for topnotch performance. Write for complete specifications and illustrated brochure.



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New ABRASIVE

B-11
PLAIN MILLING MACHINE

- FULL ELECTRICAL CONTROL
- SAFETY FEATURES
- CLIMB MILLING IN EITHER DIRECTION
- FAST TABLE TRAVEL OF 300" A MINUTE

FOR COMPLETE DETAILS SEND FOR B-11 BULLETIN

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ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL CO. EAST PROVIDENCE, 14, R. I. Dealers in Principal Cities

HOW TO GET THE *most economical solution* to your milling production requirements

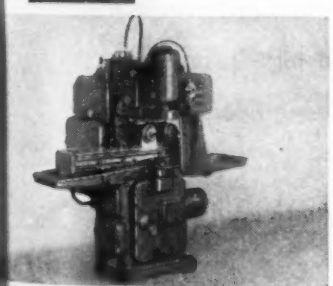
SUNDSTRAND ENGINEERS can solve it whether it requires...

1 Standard RIGIDMILS with Standard Tooling

Standard Rigidmil with Standard Tooling

Whenever possible, milling production problems are solved most economically by standard Sundstrand Rigidmils using standard attachments such as vises, indexing bases, vertical heads and any other standard equipment which can solve the problem economically. Next most economical solution is...

2 Standard RIGIDMILS with Special Heads and Tooling



dard Rigidmil with Special Tooling

Standard Sundstrand Rigidmils are designed to accommodate the application of a wide variety of special heads and tooling. Consequently, an unlimited number of milling production problems can be solved with special arrangements of standard Rigidmils. When not economical to do this, our Engineers can design...

3 Entirely Special Machines

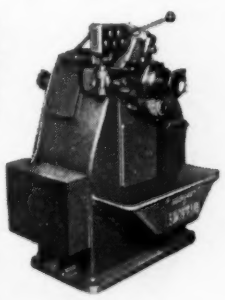
These machines are designed only when the required production cannot be obtained most economically by either of the foregoing methods.

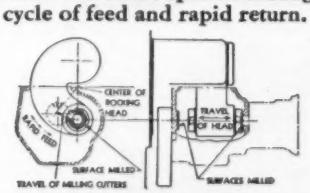
Milling Internal Gear Bosses

The design of this transmission case is such that it placed a limitation on the size of the cutter head that could be used. The drawing below illustrates the method in which these out-of-the-way bosses were reached.

Operations—The operations consist of milling one of the bosses first, then shifting the cutter head and milling the other bosses.

The Machine consists briefly of a compact cast iron base having a rotating drum type spindle carrier. The drum is powered for rotation to rock the cutter spindle through a cycle of feed and rapid return.





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These free booklets cover the entire range of Sundstrand Standard Milling Machines. Write for them today. Ask for bulletins 118. If your problem cannot be met with these standard millers our engineers will be glad to assist in the designing of a special machine to do the job economically.

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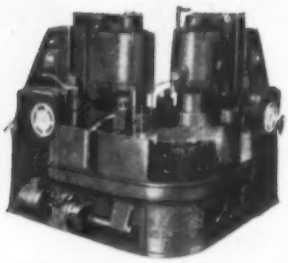
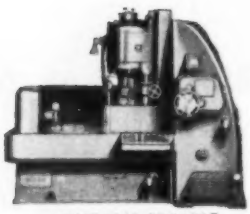
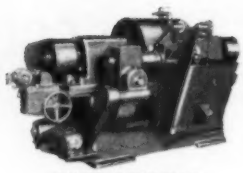


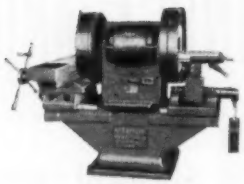
VERTICAL MULTI-SPINDLE ROTARY TYPE SURFACE GRINDER



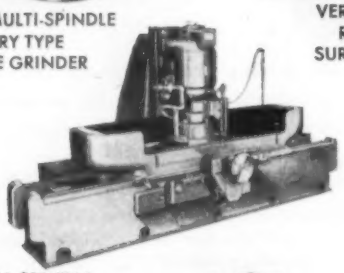
VERTICAL SPINDLE ROTARY TYPE SURFACE GRINDER



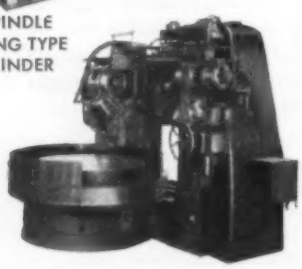
DOUBLE SPINDLE DISC GRINDER



SINGLE SPINDLE DISC GRINDER



VERTICAL SPINDLE RECIPROCATING TYPE SURFACE GRINDER



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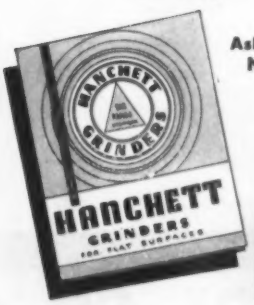
When selecting a surface grinder your first consideration is for a machine which will most efficiently solve your grinding problems. Hanchett engineers can give you an unbiased opinion. The wide range of Hanchett types makes possible this unique service wherein the grinding *principle* is the prime factor. Made by specialists in Flat Surface Grinding, the complete Hanchett line includes all of the types shown here, and many others. If you are experiencing difficulties with surface grinding jobs on which precision and high production are of paramount importance, let our engineers recommend the type of surface grinder which will provide the best solution. Write today outlining your requirements.



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WAR production and post-war production suffer when obsolete machines are used. Costs are higher, manpower is wasted, output is less.

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Every Liberty detail is engineered by craftsmen having more than a quarter century of specialized "know how" experience; assuring extra durability, power, longevity.

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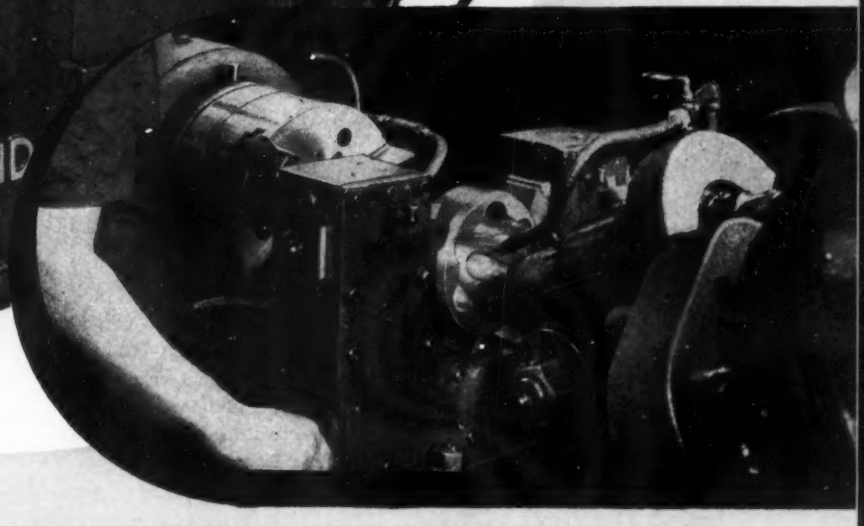
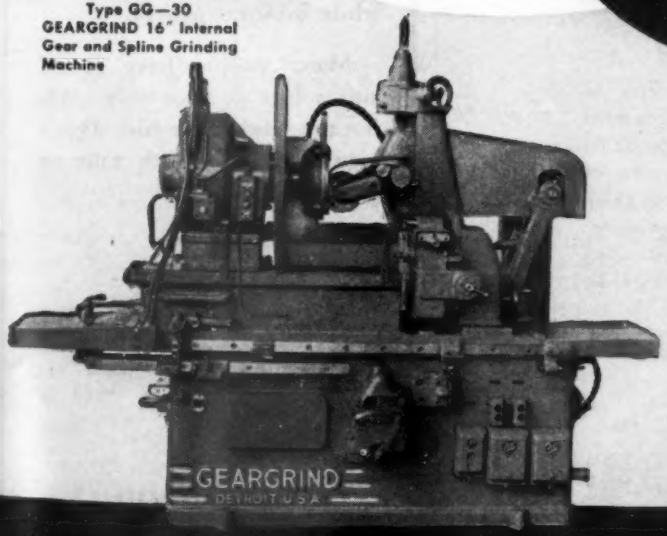
GEARGRIND GROOVE DRILLING MACHINE

Type GDR—2
GEARGRIND Groove
Drilling Machine



Type GG—30
GEARGRIND 16" Internal
Gear and Spline Grinding
Machine



This GEARGRIND Machine drills the roughed-out ball grooves on the Rzeppa Constant Velocity Universal Joint. The drill, mounted on two cranks, implies motion in an arc, is adjustable for arcs with radii from 1½" to 3".

Feeding and indexing are hydraulically controlled. Work is clamped in place with an air chuck. Hydraulically operated steadyrest. Automatic drill feed to predetermined depth. Work indexes and repeats. Rapid traverse to and from work. Production up 52 per cent over former method.

Write us regarding special machines, as well as standard GEARGRIND Machines for fast, accurate production of external and internal gears, external and internal involute splines, straight splines, serrations and racks. Catalog on request.

The GEAR GRINDING MACHINE COMPANY

DETROIT 11, MICHIGAN, U. S. A.

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Steel Offers Product Benefits in Greater Numbers . . . .

STEEL is one of the most versatile materials in the world. Its outstanding characteristics are *ductility* AND *strength*. A multitude of slight changes in chemical analysis of steel permits a wide variety of physical properties to meet specific needs. More than that, cold working and heat treatment enlarge steel's scope of applications. Cold rolled Thomastrip is an excellent example.

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Cold finished steel is the most refined of all steel products. As cold rolling makes thinner gauges possible, it also provides more accurate control of finish and thickness. Coupled with specialized cold rolling experience are Thomas facilities—a wide variety of rolling mills for special requirements . . . a highly versatile group of annealing furnaces for a wide range of needs . . . equipment for continuous plating and also lacquering. Thus Thomas offers a wide variety of products. Make steel your first choice—let Thomas solve your problem.

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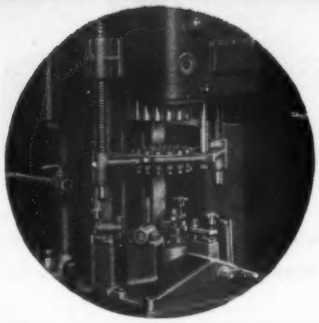
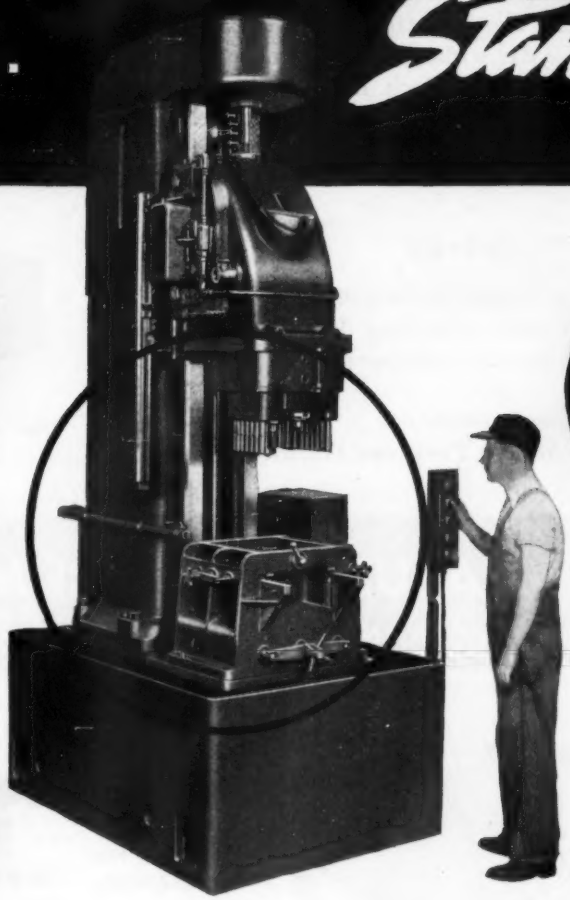
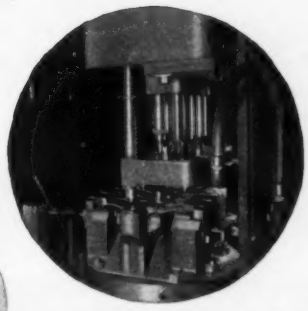


The 16-spindle drilling and reaming head shown above adapts the 914 machine to eight operations on seven different aircraft parts with only minor fixture changes. A 2-speed shift arrangement in the head provides a change from reaming speed on steel to reaming speed on aluminum, giving even greater versatility.

This W. F. and John Barnes 914 machine is one of the many such machines adopted by the automotive industry, and is assembled, as shown above, with an additional unit. This setup accomplishes drilling, boring and reaming operations on both left and right hand brake cross shaft brackets. Changes in design do not obsolete these machines since basic units are standard and only fixture and tooling design need be changed to meet new production requirements.



The W. F. and John Barnes No. 914 machine shown above is provided with 26 spindles for drilling and countersinking operations on a supercharger rear casing cover. With the exception of fixture and tooling design, this machine is standard in every respect.



Side links for chains were drilled from solid with W. F. and John Barnes 914 machine tooled, as shown above, with an 8-spindle drilling and reaming head and fixtures designed as illustrated. Four spindles are stationary. The other line of four spindles have adjustments to handle variance in center distance of from 3 to 4⅛ inches. A rotary indexing fixture table allows the operator to load four links while four are being machined.

Fixture and Tooling Only Engineering Required to Fit the 914 to Your Job .....

The W. F. and John Barnes 914 is a versatile standard machine of unit type construction designed for flexibility in drilling, reaming, boring, chamfering, milling, hollow milling and facing operations. Only changes in tool and fixture design are necessary to adapt this machine to a wide range of production jobs.

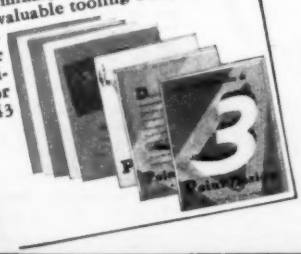
The 914 assembly consists of three elements — a base to mount the column, fixtures and to act as a storage for coolant when required; a column to carry the machine ways and to house the counterweight and drive motor; a sliding head unit to mount and feed tools and to house the hydraulic actuators.

To these standard units, tools and fixtures of appropriate design to meet your special production requirements are added. Changes in machining sequences or in the design of your product do not obsolete this machine since the basic assembly can easily be adapted to other types of work as shown here.

WRITE TODAY — For FREE 12-page Folder describing and illustrating the 914 Vertical Machine.

OTHER SPECIAL APPLICATIONS OF BARNES UNIT-TYPE MACHINES

Write today for this series of 8 Bulletins, each of which traces a machining problem from the preliminary survey to the final solution. Get valuable tooling suggestions that may increase your production efficiency. Ask for Bulletins 1143



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W. F. and JOHN BARNES

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● Designed to replace special gages, flush pin gages, snap, height gages. For accurate, convenient and quick checking of components, either in the tool room or on the production line. Permits precise gaging throughout the whole day without eye fatigue. Each division of the scale represents 1/10,000th of an inch. Interpolations of .00005 easily achieved. Clear readings on 6" scale with inch and millimeter readings. Magnification is 1000. Measuring capacity ± .003 and ± .05 mm.

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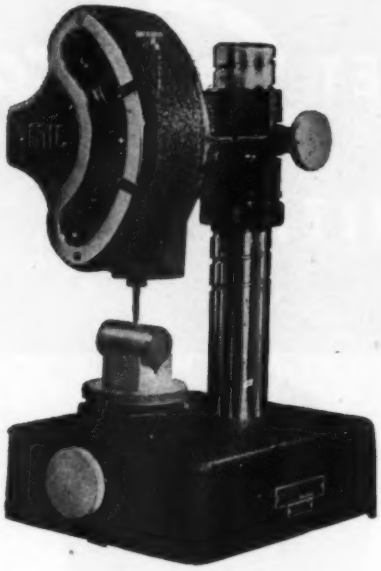
Manufacturers of
Gages, Jigs, Fixtures, Service Tools and Precision Units



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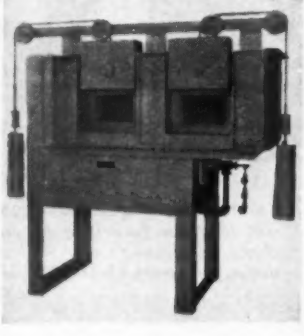

Designed to assure fast, economical heat treating of carbon and high-speed steels requiring temperatures ranging from 800° F. to 2350° F. May be oil or gas fired, and furnished with muffles and prepared atmosphere. Temperature of high heat chamber at left is automatically controlled. Temperature of pre-heat chamber at right is controlled by sliding damper over by-pass between the two chambers — a definite improvement over old style two-story furnace in which the temperature of pre-heat chamber could not be controlled.

VULCAN furnaces of this type can be supplied in standard sizes from 13" x 13" to 18" x 36" hearth area.

For further details, write for Bulletin 935. For furnaces of other types, send for Bulletin "V".

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HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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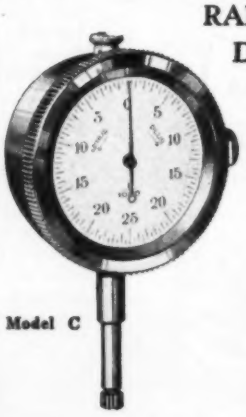
RANDALL and STICKNEY
Dial Gauges and Indicators



Model C

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for catalog describing our complete line.

RANDALL & STICKNEY
Waltham, Mass., U. S. A.
Makers of Dial Gauges Since 1885

Where fighting ships are built

OLIVER Drillpointers

assure "top" drill performance

U. S. NAVY PHOTO

In the Navy Yards and private shipyards where Uncle Sam's battle craft are built, repaired and overhauled — there are a hundred-and-one different kinds of drilling jobs to be done . . . done well, and fast. On this gruelling work, drills must stand up, must perform with new-tool precision as long as they last. That's why you'll find Oliver No. 510 Drillpointers in many such shops! They produce—automatically—accurate points on all drills from 1/4" to 3" dia., and any point angle from 82° to 160°. The Oliver hollow-ground point with variable clearance assures lasting accuracy and longer wear on the toughest drilling assignments. Send for full details.

Above: The Oliver No. 510 Drillpointer. Quickly set up for all drills from 1/4" to 3" dia., for any point angle from 82° to 160°. Saves production hours and valuable tools by assuring greater number of accurate holes from each drill.

Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.
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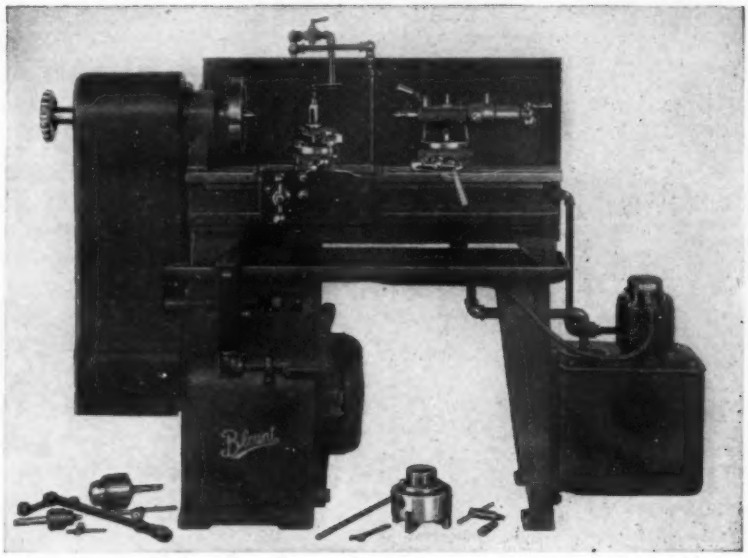
AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

"Blount" Model B-5 Special Purpose LATHE

Adaptable to handling many new types of work . . . . .



The Model B-5 Blount Special Purpose Lathe together with various attachments available for it, is capable of wide utility, including turning, chucking, polishing and lapping.

It is equipped with a ½ H.P., 4-speed ball bearing headstock motor-in-leg which provides speeds of 575, 850, 1125 and 1725 R.P.M. It has an 11" swing and a 4' bed. Other speeds, swings and bed lengths are also available. With adjustable bracket mounted motor, belted to head, spindle speeds of 360, 510, 680 and 975 R.P.M. are offered.

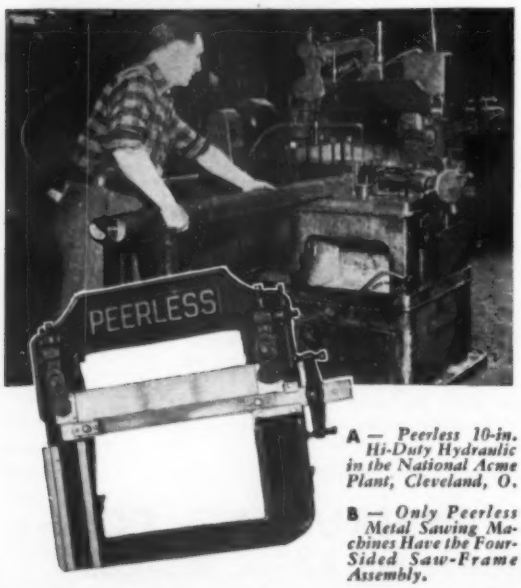
This lathe is equipped with drum controller, magnetic starter with pushbutton and disconnect switch. Spindle nose is 2⅜" dia. 10 v. threads. Spindle is fitted with hand wheel draw-in mechanism to accommodate Rivet No. 6 Collets, ⅛ to 1" capacities.

Equipment includes hand feed carriage and compound rest, full set-over-swivel tailstock V-belt drive and belt guard. Also coolant system complete including tank, strainer, pump, valves and piping.

Various accessories and attachments are also available.

Send for Bulletin D-18 which describes the various new Special Application Lathes developed by Blount.

J. G. BLOUNT COMPANY
Everett, Mass. U. S. A.



A — *Peerless 10-in. Hi-Duty Hydraulic in the National Acme Plant, Cleveland, O.*

B — *Only Peerless Metal Sawing Machines Have the Four-Sided Saw-Frame Assembly.*

Peerless Blade Control

for ACCURACY and SAVINGS in TIME and METALS

NO other metal cutting saws can cut with such accuracy and speed as Peerless Metal Sawing Machines. When metal is cut the Peerless way, there is no surface hardening or fracture or undue blade wear and breakage. The reason for Peerless high-speed precision cutting is the Four-Sided Saw-Frame Assembly. The blade is locked securely in place. Maximum tensioning is applied without bowing or tilting. On every return stroke the Peerless blade clears the work and chips are washed away *before* the cutting pressure is applied. Taking as little as 1/16 inch for the cut, Peerless Metal Sawing Machines save enough critical metal to make "extra" pieces from the stock being worked.

Get *all* the facts! Mail the coupon for folders and estimate of cutting time on your toughest operation.

PEERLESS MACHINE COMPANY
1600 JUNCTION AVENUE • RACINE, WISCONSIN

PEERLESS MACHINE COMPANY, Dept. AM-1143, Racine, Wis.

Mail cutting time estimate for.....

- ☐ Mail catalog on Hydraulic type Saw for High Production Cutting
- ☐ Mail catalog covering Vertical type used for Die Block Work
- ☐ Mail catalog on Mechanical type Saw for production cutting
- ☐ Mail catalog on general utility and maintenance Saws

Company.....
Individual.....
Street.....
City..... State.....

Peerless
THE ONLY METAL CUTTING SAW
WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE Sawing DEMANDS PEERLESS BLADE CONTROL

VERY DIFFICULT INTERNAL FINISHING PROBLEM SOLVED

with the Sunnen Precision Honing Machine!

Too many scrap parts — was this manufacturer's problem. Too many 20 MM steel aircraft gun parts were being rejected because they weren't meeting the tolerance specifications. By the previous method of finishing, parts were often cut oversize, through no fault of the operator, and had to be scrapped.

A consultation with a Sunnen Service Engineer led to the installation of the Sunnen Precision Honing Machine to handle these finishing operations. In the manufacturer's own words — "This machine is going to pay for itself many times over in a short while in saving of scrap parts and time." In addition, he is getting a better surface finish.

The coveted Army-Navy "E" waves over the Sunnen plant —evidence of the important part Sunnen equipment is playing in the war effort.

Consider These Advantages

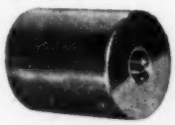
Wide range—handles internal diameters of .185" to 2.625". Accuracy within "one-tenth" guaranteed — has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical — inexpensive — economical to operate.

Put Sunnen Honing to work in your plant!

The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen Equipment is playing in the war effort.

Typical Jobs

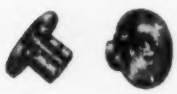
Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Bearing. A very small part. 2 micro-inch finish necessary.

Cast Iron Valve Stem Guide. 1/2 to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Shell Loading Die.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

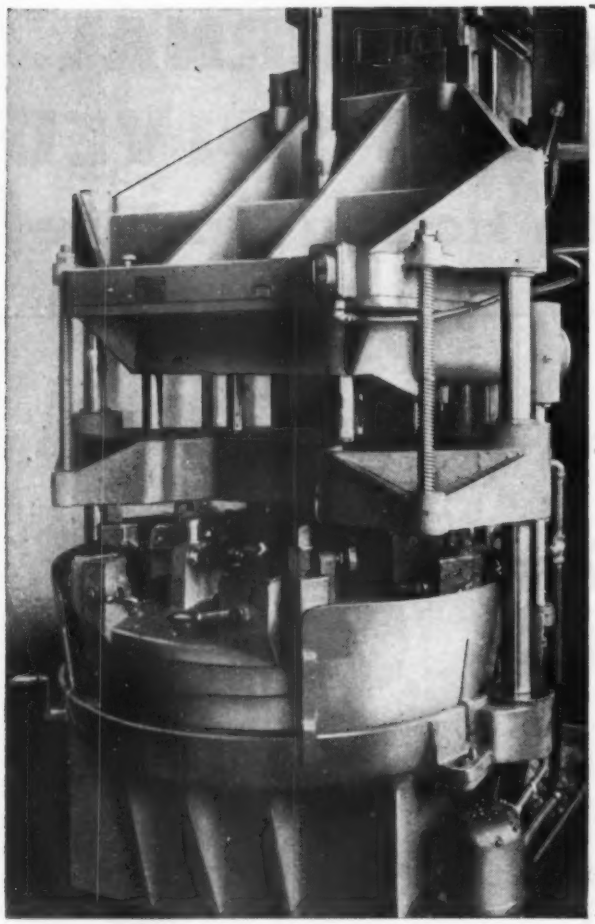
Aluminum Aircraft Link "produces high finish without bell-mouthing."

Compressor Yoke. Alignment maintained and better finish produced.

SUNNEN

SUNNEN PRODUCTS COMPANY • 7941 Manchester Avenue, St. Louis, Missouri

Canadian Factory: Chatham, Ontario



Buhr COMPLETE RETOOL that INCREASED PRODUCTION

Complete Retool of a Vertical Hydraulic Drill Press

Consists of:

5-Spindle Multiple Drill Head with one accelerated spindle for reaming in the fourth station.

Bushing Plate.

Six Fixtures mounted on a plate attached to a six-position Index Table with compound trough.

This mounts on a base which is used as a compound tank.

Buhr retooling combines speeding up and simplifying operations. Users of Buhr equipment are getting the added advantage of rugged construction, stamina that permits continuous operation on the toughest wartime jobs.

BUHR MACHINE TOOL CO.
Green and Davis
ANN ARBOR MICH.

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

PORTAGE

NO. 4

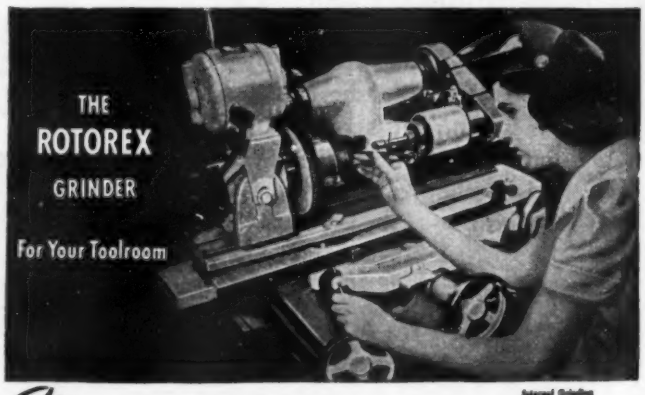
HORIZONTAL BORING DRILLING & MILLING MACHINE

• Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO



Internal Grinding

Means MORE SATISFACTORY PERFORMANCE FOR YOU

Cylindrical Grinding

Rotorex Grinders are in service everywhere performing operations of grinding and sharpening where speed and precision on vital war material is required.

On a production line, as well as in tool maintenance a wide range of work can be done on the Rotorex such as: cylindrical and internal grinding as well as sharpening of all kinds of tools to the closest of tolerances.

Easy interchangeable attachments for faster set-ups, selective speed range from 3000 to 6000 rpm are outstanding features.

Simplicity of design and operation makes it possible for even inexperienced workers to operate with the highest efficiency after a short period of training.

Write today for the new 100 page grinding handbook No. 501 for the Rotorex Universal Tool and Cutter Grinder.

Top Grinding Attachment — Sharpening Helical Cutter — Radius Grinding Attachment

INCREASED FACILITIES enable us to make PROMPT SHIPMENTS

DOUGLAS MACHINERY CO., Inc.
144 BROADWAY • NEW YORK, N. Y.

Are you getting the MAXIMUM from your cutting tools?

ASK FOR BULLETIN No. A-243-12

ASK FOR BULLETIN No. A-243-22

Tools must be conserved in these days of limited resources. Every tool thrown away means loss in materials and production time — and a loss to the nation's stockpile of critical war supplies.

Today, Tool Conservation is a "must" in every plant. Covel's two cutter and tool grinders — the No. 12 and the No. 22 — will grind and condition your tools with efficient precision at great savings in time, money, and materials.

Many broken or worn tools now consigned to the scrap pile can be rescued and with these Covel machines reclaimed for valuable work — perhaps for a new kind of job.

"Tools Are Weapons — Treat 'Em Right" with "Covels". Send today for Covel Bulletins No. A-243-12 and A-243-22, for the full story of what these machines can do for you.

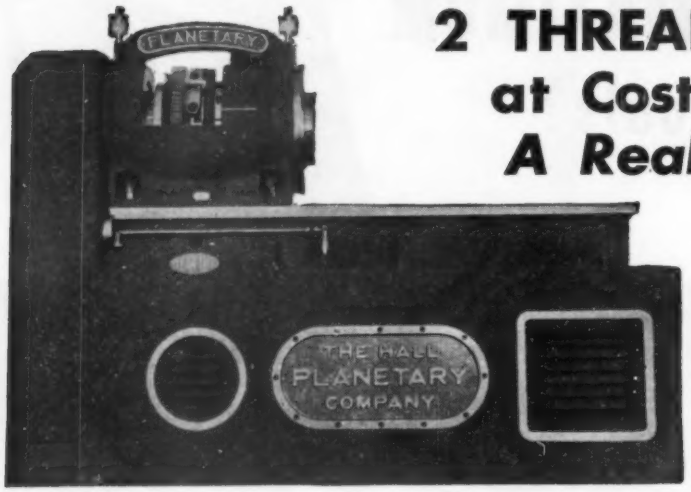
GRINDING MACHINERY SINCE 1874

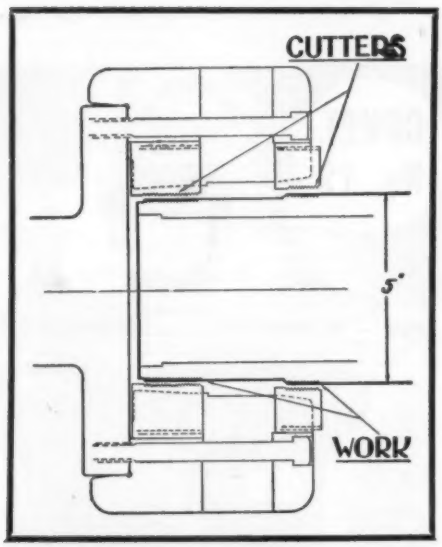
COVEL INDUSTRIAL GRINDERS

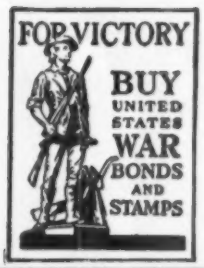
COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

PLANATHREADING

2 THREADS MILLED at Cost of One
A Real Saving







This Job in 5 Minutes

Perfect Alignment and Location of Threads.

LET US SOLVE YOUR THREADING OR MILLING PROBLEMS.

THE HALL PLANETARY CO.
Fox and Abbotsford Ave., Philadelphia, Pa.

Grand Rapids

DRILL AND TAP GRINDERS

Model 10-B

Other Combinations Also Available

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes No. 6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. S.W.
GRAND RAPIDS MICH.

Here's **SPEED** . . **FAST SET-UP and ACCURACY**

JIG BORING • MILLING *with* **Micrometer Setting**

Most every machine shop has one man who's a "wiz" at cutting corners, devising tricky methods and set-ups to produce dies, patterns, molds, jigs, fixtures, etc.

But his time is valuable . . . and he may be tying up machines of larger capacity than required for little jobs.

Such men will instantly see the need for the LINLEY — an all-around time and money-saver for the countless and varied jobs which confront a busy toolroom. It's compact, rugged and fast . . . 8 speeds (275 to 4250 r.p.m.) The direct reading micrometer depth gauge prevents pencil figuring errors. The counterbalanced quill removes backlash and every design and construction feature contributes to precision production.

Why not send for our instructive bulletin and discuss the advantages of a Linley installation with your skilled machinists.

LINLEY BROTHERS COMPANY
664 State St. Extension
BRIDGEPORT 1 CONN.

Metalmaster

. . . features

Advanced Headstock Design!

HEADSTOCK—
- Heavy walls
- Sturdy center bracing
- Twelve spindle speeds, forward and reverse
- Simplified control system
- Grouped controls

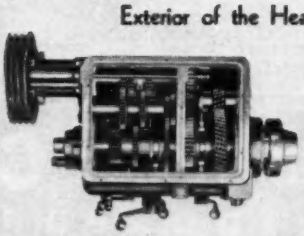
GEARS—
- Machined from heat-treated alloy steel
- Precision shaved and lapped
- Short, heavy gear shafts, mounted on tapered roller bearings
- Gear trains for the leadscrew reverse — also the fine and coarse compounding drive to the feed box — are in the head.

LUBRICATION—
- Splash as well as a self-priming pump that forces filtered oil to the upper shaft bearings, the clutch and the brake.
- Two sight gages, one indicating proper level for efficient operation — the other, the flow of oil from the pump.

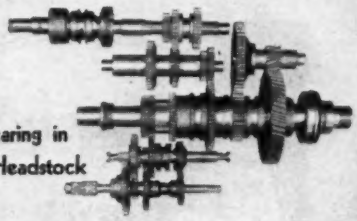
. . . advanced design, engineering and construction that makes for dependable, never-failing service!

Write today for the METALMASTER Catalog . . . contains complete design and construction data on METALMASTER 12", 14" and 16" Lathes.

Exterior of the Headstock



Interior of the Headstock



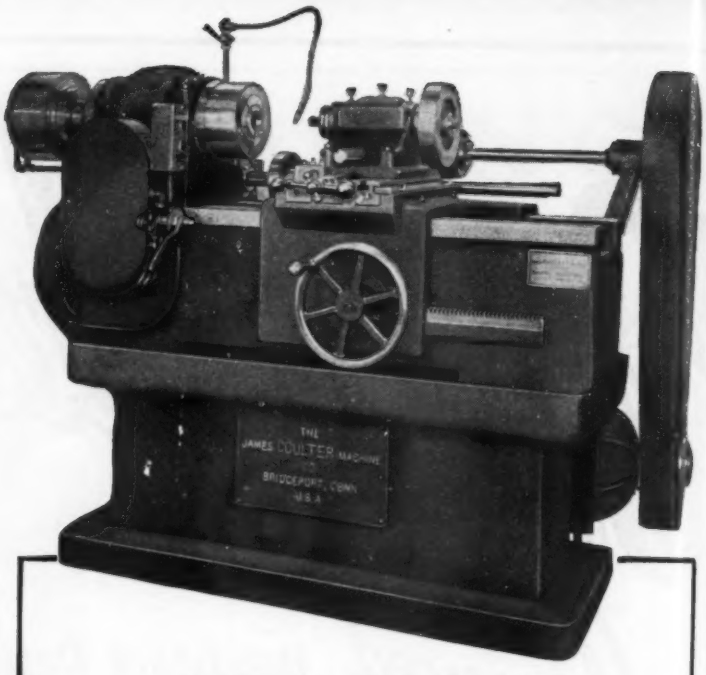
Gearing in the Headstock

The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



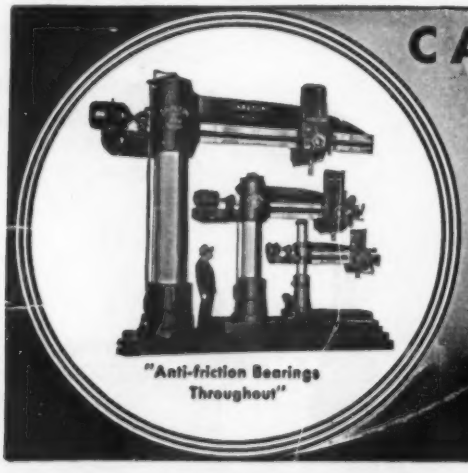
The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

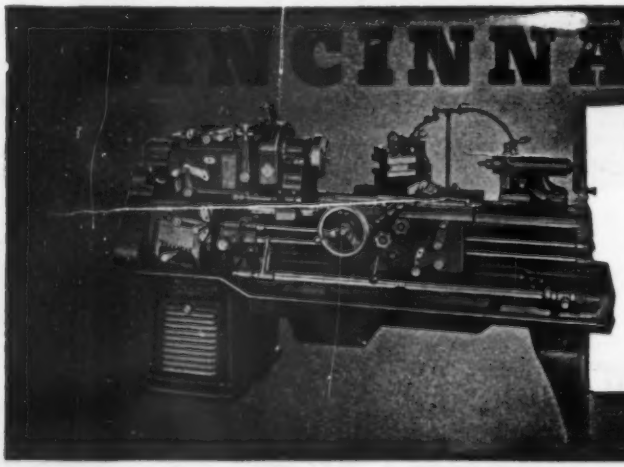
The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.



CARLTON RADIAL DRILL

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U.S.A.



Rugged . . . Accurate
Versatile . . . and Fast!

With these four qualities combined in perfect proportion, Cincinnati Lathes are capable of high production to the exacting standards required in aircraft, munitions, and other war work. Send us details of your war production jobs and let us help you tool up for maximum lathe output. Cincinnati Lathes supplied in 14" to 30" sizes. Write for latest catalog.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley — Cincinnati, Ohio
SPECIALISTS SINCE 1906

ATTACK FROM ALL DIRECTIONS

DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

• If you have a problem in the production of small ordnance components which requires simultaneous operations, the Bodine principle of design can usually solve it.

Multiple spindles (6 to 8) holding tools up to ½" diameter and with vertical stroke to 3½", operate on parts indexed to successive working stations on an automatic horizontal dial. Tools may be set for operations from above, below or horizontal to the dial . . . or from all directions simultaneously.

Drilling, Milling, Tapping and Screw Inserting may all be performed in one cycle of the dial — on one machine — or machines may be adapted to handle any one group of these operations.

TYPICAL EXAMPLE. This electrical contact blade required tapping, screw inserting (fed through a hopper to transfer mechanism, then to feed fingers under a screw-driving spindle) staking of screw (inverted spindle) and backing up of screw to receive wiring. The Bodine No. 40-10 was tooled to perform these operations in one cycle of the dial . . . automatically.

SIMPLIFIED and PROTECTED OPERATIONS

Even semi-skilled operators obtain high production with a minimum of fatigue and a mixiмum of safety. The work is placed in clamps on the dial and usually automatically ejected, Electrical interlocks protect machine, tools, the work and the operator.

Bodine operation is clean, simple work which can be performed by women and older men without exertion and with the satisfaction of making a real contribution to the war effort.

SIX STANDARD SIZES — SMALL FLOOR SPACE

• The six Bodine machines range from the No. 40-10 to the larger No. 48-30 and require from 54"x 60" to 90"x 96" floor space. They accommodate from 6 to 8 spindles. Any one of them can be adapted for a great variety of tooling set ups and sequences of production. Ask Bodine Engineers for recommendations. *Send for Informative Bulletin.*

Bodine "48-30"
AUTOMATIC INDEXING DIAL, MULTI-SPINDLE MACHINE

THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

NESTED MATERIAL IS SECURELY HELD UNDER HEAVY CUTS ON THE

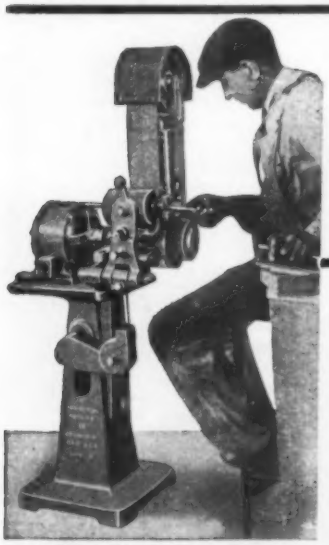
PORTER-McLEOD COLD METAL SAWING MACHINE

Ability to cut stock from 3 inches up, to nest and hold bars or shapes securely for multiple cutting, combined with a standard feed of 3" per minute enable this modern, sturdy, clean-lined machine to make big savings in cutting-off time. A wide range of work can be handled by the 8" Porter-McLeod because of its capacity for 8" round or 7½" square stock. All cuts are accurately and cleanly made at highest speeds.

Truly high production is assured by unique features of design coupled with ample power. The blade is pulled upward through the stock, the blade being supported in such a way as to prevent buckling or weaving. Protection of the blade against hard spots in the stock being cut is provided by a friction disc feed. The Porter-McLeod blades are designed so that every tooth cuts, a feature which contributes to the remarkably fast cutting assured by this machine.

If you are interested in reducing time on cutting-off operations, get all details at once. Anyway, write for Descriptive Bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.



Machine used for grinding the weld of tubular airplane parts, lubricating frame parts, and other cylindrical pieces replacing hand labor.

"PRODUCTION"
TYPE S
Centerless Polishing and Finishing Machine

A TIME SAVER ON CYLINDRICAL AS WELL AS FLAT WORK

This machine — which combines a centerless feed polishing machine with a vertical or horizontal belt grinder, surfacer, polisher or buffer — can be quickly changed from horizontal to vertical. In a horizontal position it provides an ideal means for hand surfacing. It can be used for work of any material that can be ground or polished, including metals, rubber, fiber, wood, etc.

A Centerless Feed Attachment enables this machine to automatically feed cylindrical work from ¼" to 1" diameter, without centering or chucking. Flat, irregular work can also be finished by hand manipulation by merely removing flat surfacing bed.

Abrasive belt is 4" wide; belt speed 3200 ft. per min.

Send for descriptive literature giving complete details.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

SHIELDS NO. 3 VERTICAL UNIVERSAL MILLER

Delivery 4 Weeks

CONDENSED SPECIFICATIONS

Table Working Surface—64" x 16". Longitudinal Power Travel—34". Cross Power Travel—14". Vertical Power Travel—17½".

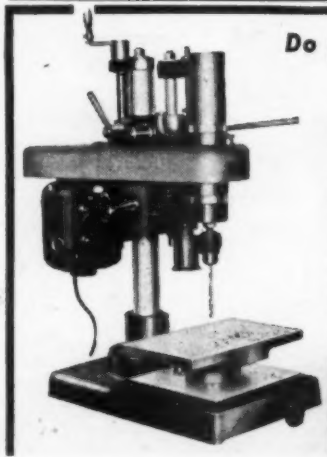
Write for complete detailed specifications

SHIELDS MANUFACTURING CO., Inc.
LONG ISLAND CITY, N. Y.

SMITH & MILLS
CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio



Do your sensitive drilling on a

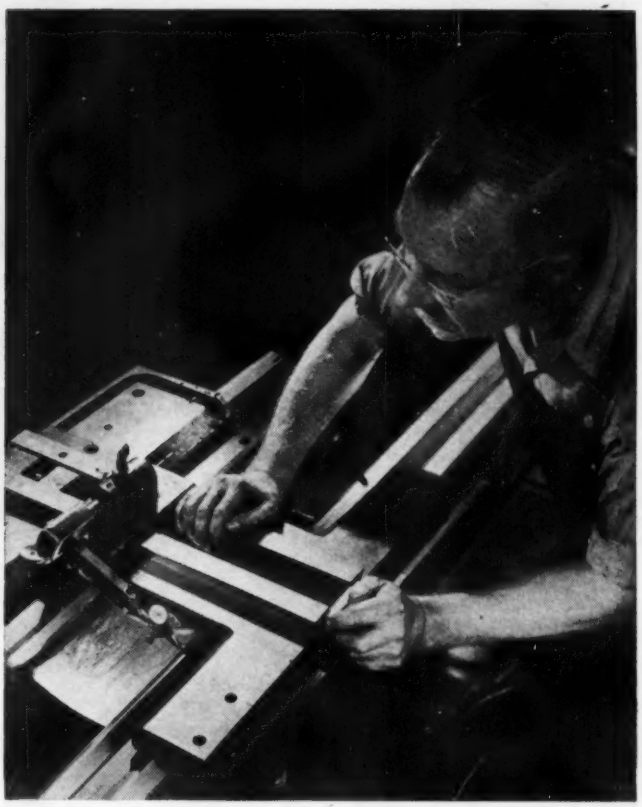
MAXI-JR-E

● Here is a high production unit for small holes from .004" to .250" diameter. Sturdy — smooth — fast —it is a self contained unit with 8 inch vertical adjustment on column. Drilling unit overhang from center of chuck to column 5". Vertical capacity 10". Available in spindle speeds from 750 to 12,000 r.p.m. Write for bulletin.

The Hamilton Tool Co.
HAMILTON OHIO

Above:

A lathe apron being tested and checked for alignment of cross and longitudinal feed worms to insure free running with feed shaft when attached to carriage, in any position along lathe bed.

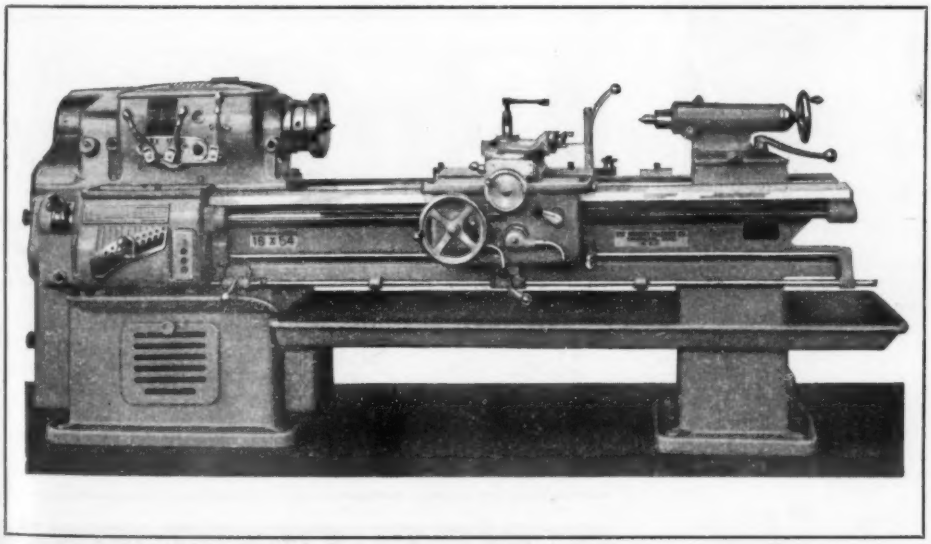


Right:

Reading alignment of carriage travel with inner ways of lathe bed after carriage has been hand scraped to a fit on the outer ways of bed.

ACCURACY *through* INSPECTION CONTROL *secured in the manufacture of* HENDEY PRECISION-PRODUCTION LATHES

All finished parts of Hendey Lathes are subject to a complete and continuing inspection control through the various stages and processes of manufacturing and assembling.



A Hendey 16"—18-speed Precision-Production Tool Room and Mfg. Lathe which incorporates the accuracies established in the two tests illustrated.

THE HENDEY MACHINE CO., Torrington, Conn., U.S.A.

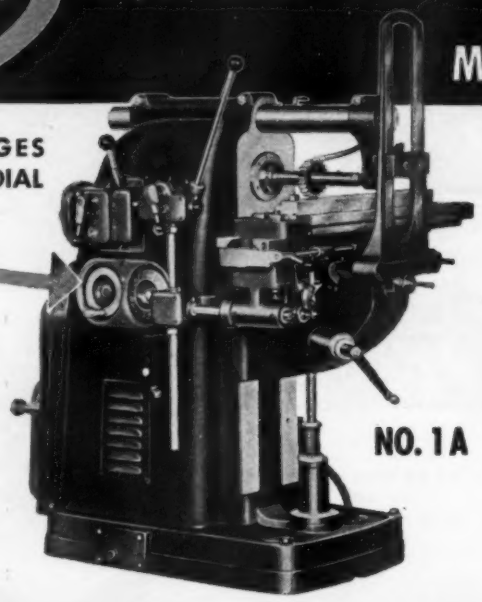
BOSTON • NEW YORK • ROCHESTER • DETROIT • CHICAGO

SELECTOR DIAL CONTROL MILLING MACHINE

WITH MICRO-SPEED DRIVE

INSTANT SPEED CHANGES AT THE TURN OF THE DIAL

Quick Deliveries



NO. 1A

CHECK THESE FEATURES

- Speeds 64 to 710 R.P.M.
- Feed Range: Longitudinal 34"; Cross 8"; Vertical 18½"
- Micro-Speed Drive
- Spindle Brake and Clutch
- Selector Dial Control

TIMKEN BEARING EQUIPPED

Today's intricate weapons of war call for small precision parts in tremendous quantities. Simmons No. 1A Milling Machine is ideal for that type of production. Here's the reason.

The Simmons Micro-Miller, equipped with our own variable speed drive and spindle brake, offers a wide range of speeds (64 to 710 RPM), any of which may be instantly obtained by a turn of the handwheel adjacent to the Selector Dial on the column. Result? The Right Speed For The Job. And that means higher precision . . . faster, more economical production!

Write TODAY for Descriptive Bulletin.

SIMMONS MACHINE TOOL CORP.

1759 North Broadway Albany 1, N.Y.

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

SIGOURNEY M-100

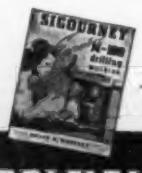
PRECISION DRILLING MACHINE

The Sigourney M-100 Drilling Machine is designed specifically for use in critical drilling where close tolerances must be maintained. Unusually sturdy construction to meet 24 hour production schedules . . . enclosed design to insure operating safety . . . sealed ball bearings throughout . . . hardened and ground spindles . . . speeds from 4000 to 10,000 R.P.M. . . . available in 1, 2, 3, and 4 spindle models.

Detailed Bulletin on request.

THE SIGOURNEY TOOL CO.

Hartford 6, Conn.



Sole Sales Agents

PRATT & WHITNEY

Division Niles-Bement-Pond Co. West Hartford, Connecticut

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

Sensitive DRILLING MACHINES Avey

CINCINNATI OHIO

KNIGHT VERSATILE MILLERS ACCURATE-RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.

ST. LOUIS MISSOURI

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers

— ROCKFORD, ILLINOIS, U. S. A. —

A 10" GIANT!

FOR *Wet-n-Dri* OPERATION

HANDLES WIDER RANGE OF LARGER PIECES

Hammond
OF KALAMAZOO

PRESENTS A NEW ABRASIVE BELT GRINDER

For LARGER WORK and CLOSER TOLERANCE

Any materials that can be ground can be surfaced or finished on the HAMMOND "V-10". Many jobs now being done on shapers, milling machines, surface grinders, disc grinders, etc., can be finished much faster and better with the V-10.

- Height 74"
- Width 22"
- Depth 50"
- Belt Platen—reversible and adjustable.
- Bearings, sealed water tight.
- Plain Table 15"x10" has slot parallel to belt for angle gage.
- Oscillating Table (shown) 15¾"x10" —3 T-Slots at right angles to belt for fixtures.
- Belt working surface with Plain Table 24" oscillating Table 17½".
- Uses Belts up to 10" widths.
- Motor: 5, 7½ or 10 H.P.

HAMMOND
"Model V-10"
10" Machine Shown
with
Oscillating Table
Manually Operated

Special work holding fixture mounted on table

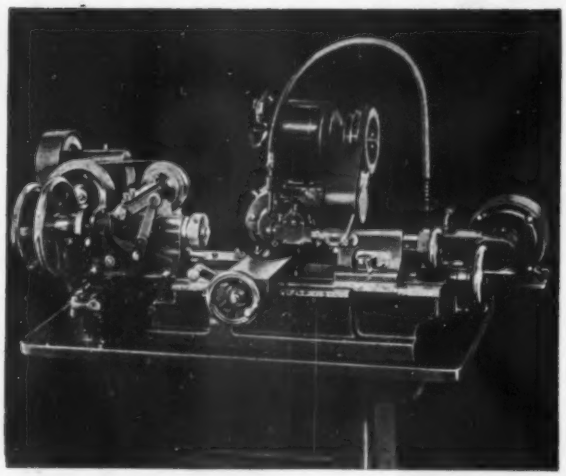
WRITE FOR BULLETIN 302

Hammond
Machinery Builders INC.
KALAMAZOO 54F, MICHIGAN

1618 DOUGLAS AVENUE
Eastern Branch—71 West 23rd Street, New York 10, N. Y.

OTHER HAMMOND ABRASIVE BELT GRINDERS

Type 400 — 4" Belt Grinders. · Type 600 — 6" Belt Grinders
All machines are Wet-n-Dri Type or Dri Type Only
Also
Backstand — Idlers for use in converting standard type Polishing Lathes to Abrasive Belt operating units.

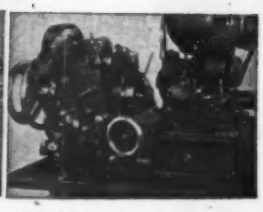


WALTHAM THREAD MILLERS

are time-savers in the production of precision threads

Whether for tool room or the production requirements of standard or other thread forms, these sturdy improved machines can be depended on for high production and accuracy. Their versatility is practically unlimited because with the cutters available not only standard threads but also special forms including V, N, Whitworth, Buttress, etc., can be produced with utmost convenience and precision. Work up to 3" in diameter can be handled although 2" or less in diameter is recommended.

Machine equipped with Internal Threading Attachment having special motor driven cutter head.



Machine equipped with Relieving Attachment. A special work head replaces lead screw.

These machines feature three motors which provide individual and wide speed change and reverse for cutter and work. Pump is operated at constant speed. Greater rigidity of cutter head is another feature in improved design.

Standard equipment includes push button control, automatic stop, follow rest, one milling cutter, indexing device, 5 pitch lead screw and 13 change gears for cutting from 5 to 40 threads per inch.

Extra equipment available include: taper attachments, gears for cutting metric threads, metric lead screw, relieving attachment, special heads for internal and multiple thread cutting, and automatic cam operation.

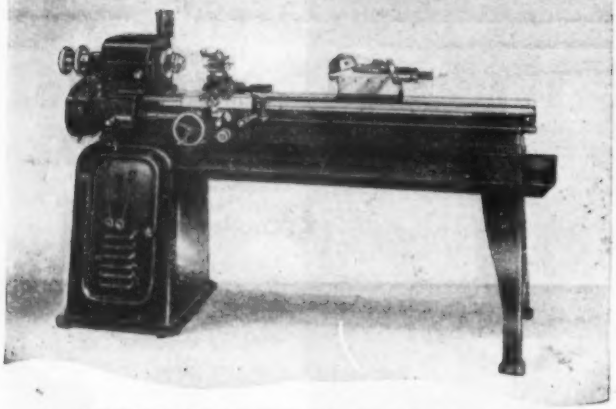
Full and complete details available promptly on request.

WALTHAM MACHINE WORKS

WALTHAM MASS.

WALTHAM

SHELDON

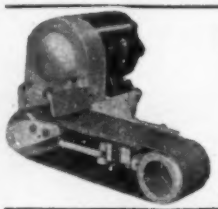


PRECISION TOOL ROOM AND PRODUCTION LATHES

Best known as quality tool room lathes, SHELDON Precision Lathes are also ideally suited for much second operation and other production work because of their extra collet capacity, sturdy construction, accuracy and available production features including: Lever operated Bed Turret, or Tool Post Turrets, Lever operated Collet Attachments, Tailstocks, Double Tool Posts, 4-speed underneath motor drives, etc. If you are looking for a 10", 11" or 12" Precision Lathe for the Tool Room or Production Line, be sure to see the SHELDON Lathe before you order.

SHELDON MACHINE COMPANY, INC.

4234 N. Knox Ave. CHICAGO 41, U.S.A.



STANDARD D-4 ABRASIVE BAND GRINDER

This new bench type grinder assures fast quality finishing on metals, plastics, wood, fibre . . . at low cost. Equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. Ideal portable unit.

Informative Booklet on Finishing Free

WALLS SALES CORP., 96 Warren St., N. Y. C.

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS · CRANK SHAFTS

Drilling and Tapping Machines

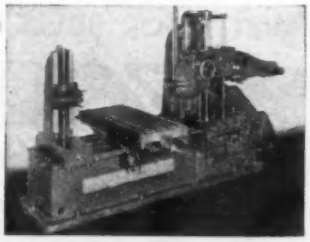
(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

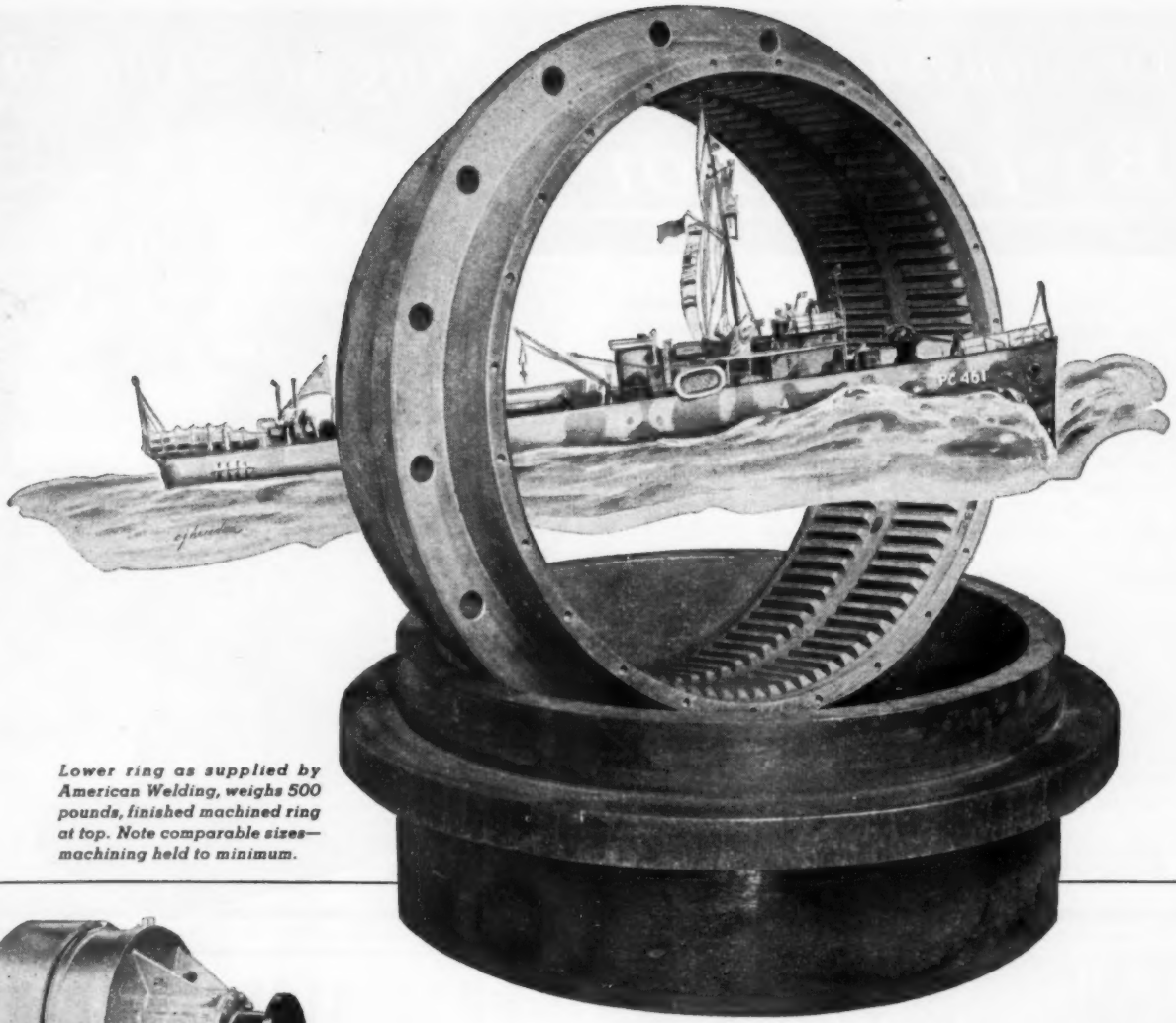
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



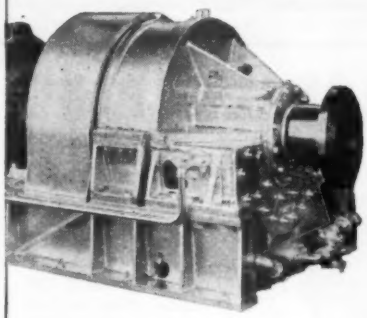
Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.

Hudson, Mass., U. S. A.



Lower ring as supplied by American Welding, weighs 500 pounds, finished machined ring at top. Note comparable sizes—machining held to minimum.



RINGS *that chime Victory*

LIGHTNING-LIKE maneuverability . . . full speed ahead—*then reverse!* The clutches in P. C. boats and other Navy and Marine Service Craft must be able to "take it". Giving such service are thousands of Fawick-Airflex Clutches with American Welded Steel Rings.

These clutches are designed with extremely close tolerances. In keeping with such precision, American Welded Steel Rings are used because they allow closer tolerance and less machining time without sacrifice in strength.

If you use, or plan to use, rings, bands or ring assemblies, let us show you how it will be to your advantage to use American Welded Steel Products. Send for folder, "Welded Rings and Bands". The American Welding and Manufacturing Company, Warren, Ohio.

BUY MORE WAR BONDS

AMERICAN WELDING

STEEL PRODUCTS FABRICATED BY RESISTANCE, SPOT, ARC OR GAS WELDING

Announcing a new shaping attachment by Bridgeport

This new sturdy accurate attachment — for which a tremendous demand has existed — is at last in production and available for use on existing Bridgeport Turret Milling Machines now in the hands of users. It can also be mounted on all types of milling machines and on special production equipment.

As applied to "Bridgeport" machines it is mounted on the back end of overarm and can be set for operation at all angles. It provides a fast, convenient and practical means for shaping large and small die and mold work. It is extensively used also on intricate production jobs where slotting operations are necessary.

The Bridgeport Turret Milling Machine — a machine of outstanding versatility and flexibility — features the Bridgeport Milling Attachment which enables it to handle drilling, boring and milling at all angles without changing set-up of work. All modern features of the conventional milling machine are available which with this attachment makes the Bridgeport a universal machine of unparalleled utility.

Bridgeport High Speed Milling Attachments, like the Shaping Attachment, can be mounted on milling machines of all types and on many types of special production equipment.

Write for Illustrated Bulletins giving complete information.

THE BRIDGEPORT MACHINES, Inc., Bridgeport, Conn.

L & D

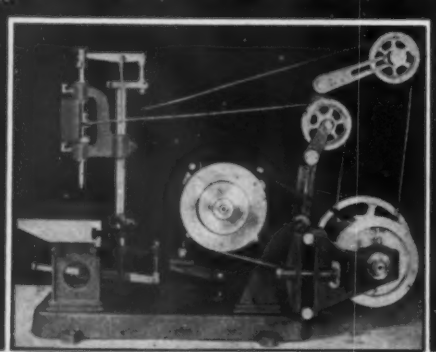
Super Sensitive DRILL PRESS

— UP TO 23,000 R. P. M.

The Lord and Davis Super Sensitive Drill Press is designed for drilling holes from .004" to 1/16" in diameter. Proper cutting speeds are obtained by running the spindle at any of eight standard speeds from 3,000 to 23,000 R.P.M.

Finger-tip control, plus precision, balanced construction, allows heavy feeds and extreme accuracy with a minimum of drill breakage.

Machines are available with one, two, three or four spindles. Write for folder.



EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

PRECISION LAPPING

of thread and other gages in the plant of Bausch & Lomb Optical Company. Machine used for this delicate job is a Schauer Variable Speed Lathe — modified to permit the operator to reverse the directional rotation of the spindle quickly, so that the lapping tool will move back and forth across the face of the gage, thus eliminating the necessity of raising the lapping tool from the work each time the tool has traveled the length of the thread.

Magnetic reversing switch, foot lever controlled, leaves both hands of the operator free for the work, and materially increases output.

SCHAUER IDEAL SPEED LATHES

speed polishing, grinding, de-burring, finishing and lapping of small metal and plastics parts. There is a type and size for every purpose. Write for Catalog No. 420.

ARMY-E-NAVY Awarded Oct.'42 Renewed Sept.'43

ORIGINATORS OF TODAY'S *Schauer* SPEED LATHES

MACHINE COMPANY

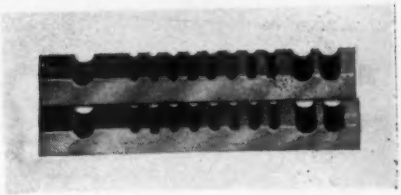
2067 READING ROAD • CINCINNATI (2), OHIO

DRESSING IS SIMPLIFIED . . . *by the New Time-Saving* C-66 . . . RADIUS DRESSER FOR SURFACE GRINDERS

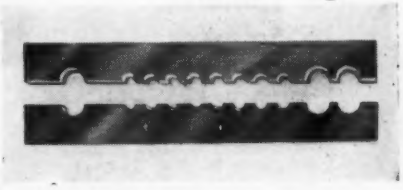
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one-hour job in 10 minutes — accurately — conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

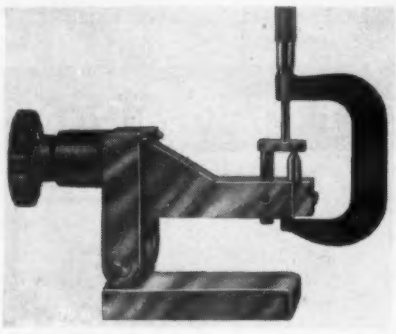
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



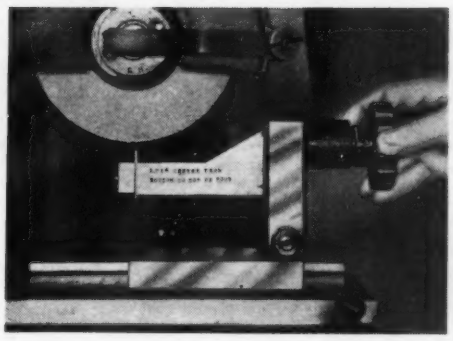
Two High Speed Tool Bits ground for drill jig.



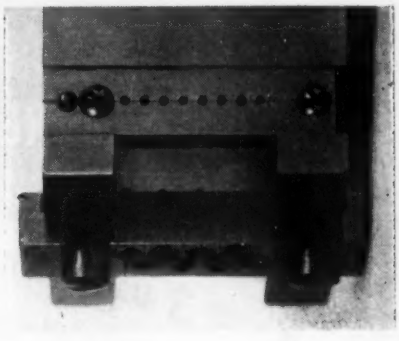
Drill jig completely assembled.



The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



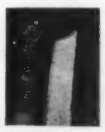
Drill jig completely assembled.

For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

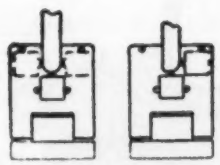
The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to ⅜" can be held accurately in line with the vertical center line of spindle.

Long Wearing Chisel Point Diamond

.013 Male and Female Radius



.500 Male and Female Radius



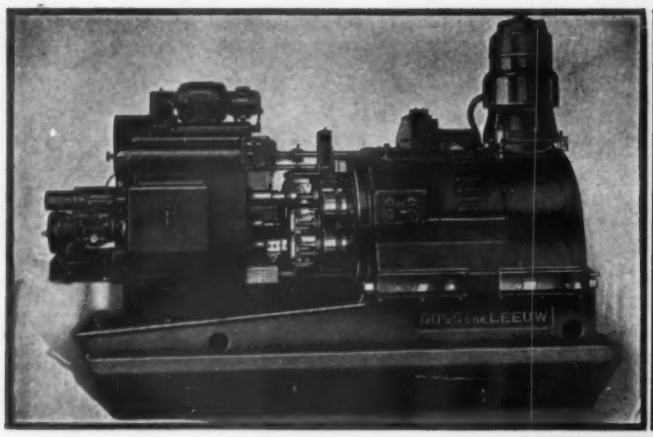
180° and 90° Male Dressing

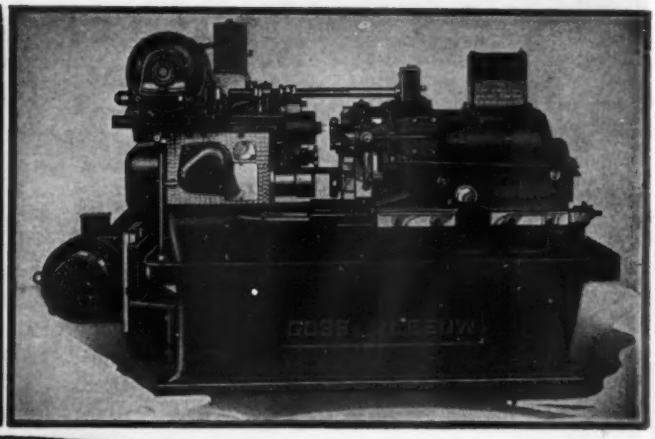
Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, ¼ K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.





WORK ROTATING TYPE

5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

4 Spindles
5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

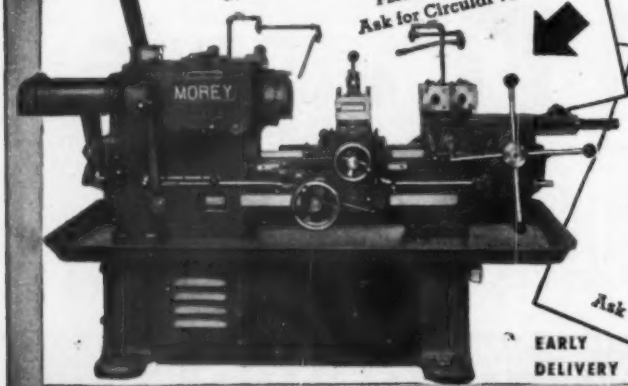
GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

MOREY TURRET LATHES

for BAR *or* CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM.
constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (pictures applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

IF YOU HAVE A *Real Problem* IN CUTTING *Non-Ferrous Metals* — PUT IT UP TO MOTCH & MERRYWEATHER . . .

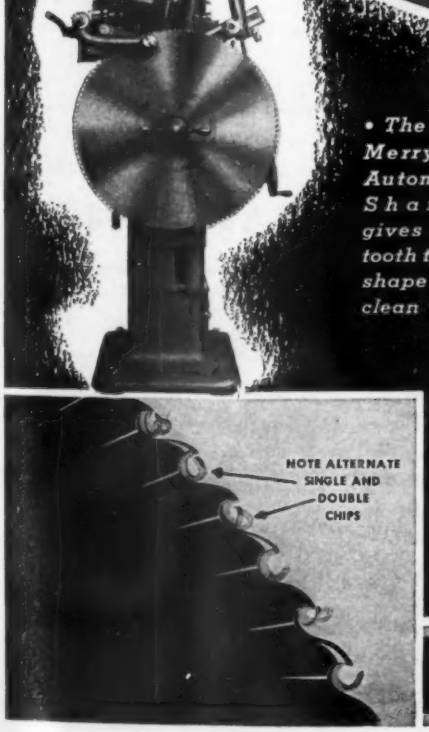
★ ★ ★

ALUMINUM • BRONZE • BRASS • COPPER • CUPRONICKEL

We'll show you HOW the **Triple-Chip METHOD** **WILL SOLVE IT!**

More than a cold sawing machine • more than a segmental type blade • more than a blade sharpener • more, even, than the three products put together . . . there's a big, important plus value for *you* in *our* experience in designing, building, testing and correlating "all 3". A wealth of data thus accumulated on the subject of cold sawing can be found within our organization, especially on the intricacies of cutting aluminum and other non-ferrous metals. Let us show you how the Motch & Merryweather Triple-Chip Method is *making* many *tough jobs easy.*

Get our illustrated Bulletin "M-10"



• The Motch & Merryweather Automatic Saw Sharpener gives to every tooth the correct shape for fast, clean cutting.

THE MOTCH & MERRYWEATHER MACHINERY COMPANY

Penton Building • Cleveland 13, Ohio

Built by **MOTCH & MERRYWEATHER**

MOTCH AND MERRYWEATHER MACHINERY CO. CLEVELAND CINCINNATI DETROIT PITTSBURGH

HANDLING A WIDE RANGE OF WORK WITH HILL HYDRAULIC SURFACE GRINDERS

★ Most HILL Precision Surface Grinders are purchased for a specific application, but all users of HILL Grinders find they are also ideally suited for a multitude of other operations.

It is this versatility that has resulted in HILL *"Open Side"* Hydraulic Grinders superseding other methods of finishing. The HILL grinder features massive construction, wide speed variation, 100% hydraulic drive, simplified controls, ample motor power for rapidly removing stock, and accuracy maintained within requirements. HILL Hydraulic Surface Grinders should have a definite place in the post-war planning of your revamped shop efficiency. HILL Grinders are built in both Horizontal spindle and Vertical spindle types in a wide range of sizes. Bulletin H-V-8 gives full details.

18" x 18" x 120" HILL *"Open Side"* Horizontal Spindle Hydraulic Surface Grinder, with magnetic chuck holding work in place.

The HILL ACME Co.

6400 BREAKWATER AVE. • CLEVELAND, OHIO

LM LM

REID Automatic Feed Surface Grinder No. 2A

PRICE $790.00 F.O.B. Less Motor

Our Dealers will help you fill out necessity priority forms.

Write us today for your nearest dealer's name and address.

A Proven Product for Over a Quarter Century with Thousands in Use Daily

Send for Descriptive Literature
EXCELLENT DELIVERIES

Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

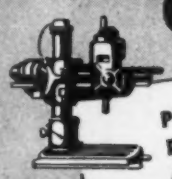
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

Giant KEYSEATERS

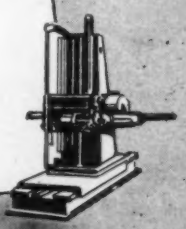
For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

Accurate tools are vital to the success of most manufacturing programs. On them falls the responsibility for the accuracy of manufacture of countless military parts. And because there is a scarcity, accurate tools should be used with **extra care.**

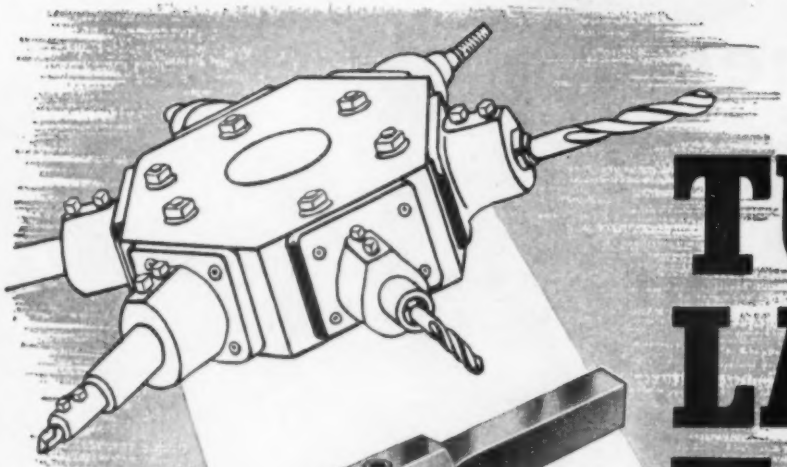
Follow the simple suggestions below:

1. **Handle tools carefully.** The accuracy and fine adjustments of precision tools can be destroyed through careless handling — by dropping the tools or permitting heavier tools to fall on them.
2. **Do not measure moving work.**
3. **Keep tools in a case or in box** in which they are packed.
4. **Protect graduations.** This is particularly important with vernier tools having fine graduations.
5. **Do not measure over abrasives and cutting edges** unless tools have special measuring surfaces for this purpose.
6. **Do not force tools.** Such treatment tends to throw tools out of adjustment and may result in serious damage.
7. **Keep tools clean** and free from moisture. Wipe them occasionally with an oily cloth.
8. **Keep tools away from steam pipes** or other heat source. Heat can destroy the accuracy of a measurement.
9. **Do not allow tools to be flooded with coolant** containing emery or other abrasive which can cause premature wear.

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.
BS

Reproductions of this advertisement for use on your bulletin board furnished on request.

BROWN & SHARPE TOOLS



TURRET LATHE TOOLS

STRAIGHT TOOL HOLDERS

PILOTED BORING BARS

ADJUSTABLE TOOL HOLDERS

SPLIT BUSHINGS

TURRET TOOL HOLDERS

FLOATING TOOL HOLDERS

ADJUSTABLE UNDERCUTTING TOOLS

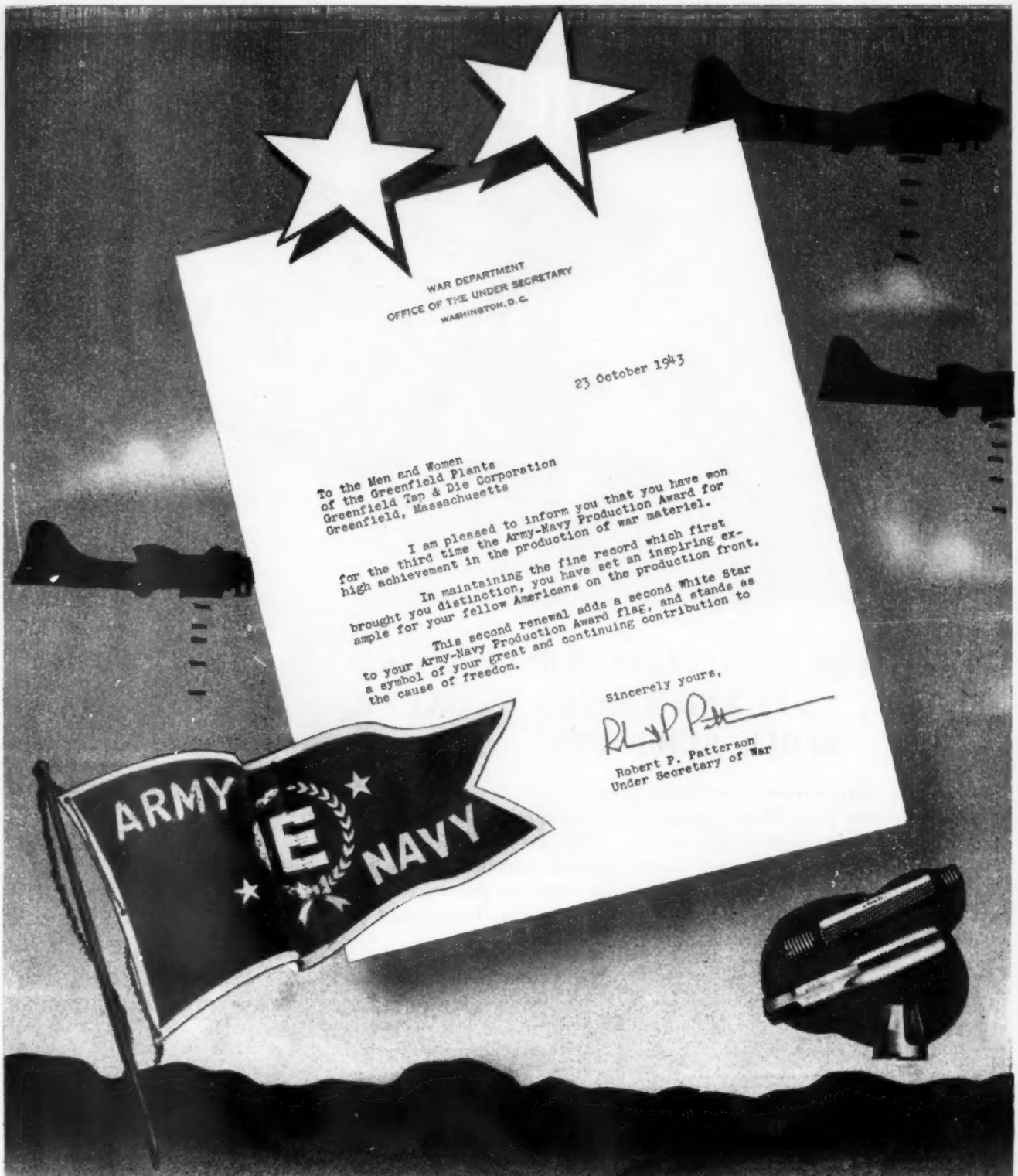
ANGULAR TOOL HOLDERS

BALL BEARING TYPE FLOATING HOLDERS

STRAIGHT ROUND SHANK TOOL HOLDERS

Designed and manufactured by Scully-Jones and Company for use in your Turret Lathes, Multi-Spindle Machines, Hand and Automatic Screw Machines ★ ★ ★ These standard tools will prove adaptable to a wide variety of work ★ ★ ★ *For Special Turret Tooling our Engineering Staff will gladly furnish designs and quotations.*

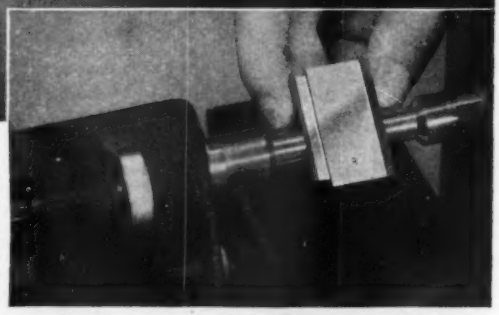
Scully-Jones
AND COMPANY
1901 SOUTH ROCKWELL STREET • CHICAGO, U. S. A.


WAR DEPARTMENT
OFFICE OF THE UNDER SECRETARY
WASHINGTON, D.C.
23 October 1943
To the Men and Women
of the Greenfield Plants
Greenfield Tap & Die Corporation
Greenfield, Massachusetts
I am pleased to inform you that you have won for the third time the Army-Navy Production Award for high achievement in the production of war materiel.
In maintaining the fine record which first brought you distinction, you have set an inspiring example for your fellow Americans on the production front.
This second renewal adds a second White Star to your Army-Navy Production Award flag, and stands as a symbol of your great and continuing contribution to the cause of freedom.
Sincerely yours,
Robert P. Patterson
Under Secretary of War
ARMY
E
NAVY

One of the most important reasons for the large number of loyal users of "Greenfield" tools has been the traditionally high quality always associated with our name. Our normal distribution, however, has frequently been disrupted by the demands of the war program which many times resulted in the shifting of emphasis from what we would have LIKED to do, to what we HAD to do. Whether you are one of those users of cutting tools whose patronage we have enjoyed, or will enjoy in the future, you can still count on "Greenfield" QUALITY, and our earnest desire to help YOU with your war production problem.

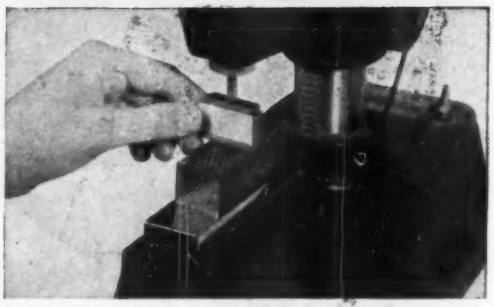
GREENFIELD TAP AND DIE CORPORATION GREENFIELD MASSACHUSETTS

Carblox CEMENTED-CARBIDE GAGE BLOCKS



. . . for WEAR RESISTANCE WHERE IT IS NEEDED . . . IN END BLOCKS IN GAGE BLOCK BUILD-UPS

Innumerable applications are being found for Carblox—the cemented-carbide gage blocks which retain original accuracy at least fifty times longer than steel blocks. They are being used in setting adjustable and solid snap gages, supermicrometers, measuring machines, jig borers and grinders, sine bars, amplifiers and dial gages, and in many other applications where gage blocks are ordinarily subject to wear.



Carblox supplement standard sets of steel or chrome plated gage blocks and are manufactured for use on each end of a build-up, serving as protective anvils and preventing wear on the less wear-resistant blocks. As a result, they increase the usable, accurate life of all gage block sets. In addition, their use largely eliminates the customary necessity of checking blocks, and reduces to a minimum scrap or rejections that might result from the use of worn gage blocks.

Literature describing Carblox in full detail and listing prices will be sent you immediately upon request . . . no obligation, of course.

ARMY (E) NAVY

LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

Helping to achieve air supremacy through the greatest production program the world has ever seen . . . is this Inserted Section Carboloy-fitted Saw, made exclusively by Disston.

Disston developed this exceptional saw for abrasive materials. And it is used by builders of aircraft to speed the cutting of ribs, struts and other structural parts made of abrasive aluminum alloys.

The unique design of this saw and its extraordinary records of continuous service without reconditioning are products of Disston's long and varied experience in the successful manufacture of *standard* tools of quality.

If you have any questions about Disston wood and metal cutting saws, files, hack saw blades, tool bits, machine knives, etc., write Henry Disston & Sons, Inc., 1120 Tacony, Philadelphia 35, Pa., U. S. A.

DISSTON

Conserve Man-Minutes **and help win the war**

So another *special* tool is aiding war production through the Disston engineering and the Disston craftsmanship that give you better working, longer-lasting *standard* tools.

PORTABLE SNAGGING WHEELS . . . . . .

For the *correct wheel* on *every* high speed snagging job, consult BAY STATE!

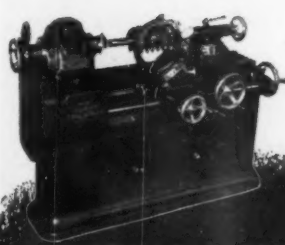
A bulletin containing specific snagging recommendations is yours for the asking.

BAY STATE
WHEELS of PROGRESS

BAY STATE

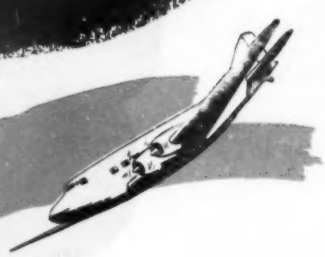
ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

ILLINOIS TOOL *Inspection*



The machine illustrated is the Universal Hob and Worm Measuring Machine. Other Illinois Measuring Machines include:

- Involute Profile Measuring Machine
- Base Pitch and Space Measuring Machine
- Helical Lead Measuring Machine
- Gear Charting Machine
- Universal Cutter and Hob Measuring Machine
- Hob Tooth Profile Measuring Machine
- Hob Lead Measuring Machine



Overnight to all America . . . From the hub of Air Transportation

WHERE EACH TOOL UNDERGOES STRICT CHECKING ON SPECIALLY DEVELOPED ILLINOIS MEASURING MACHINES!

To assure the exact accuracy of the finished tool, which is fundamental to dependable performance, Illinois Tool engineers developed many types of measuring machines for use as inspection equipment. These machines serve many different checking operations, such as: determining the accuracy of tooth profiles, helical leads and spacing of flutes.

Because of their exceptional accuracy and practicability, these machines are being used also in the inspection departments of leading metal-working plants throughout the nation.

Tools passing inspection on such equipment are certain to be accurate . . . are certain to give you the high quality of performance which careful tool buyers have learned to expect from Illinite Precision Metal-Cutting Tools!

ILLINITE

ARMY-E NAVY

HOBS • BROACHES
SHAPER CUTTERS • GEAR CUTTERS
MILLING CUTTERS • GROUND FORM TOOLS
SPECIAL TOOLS

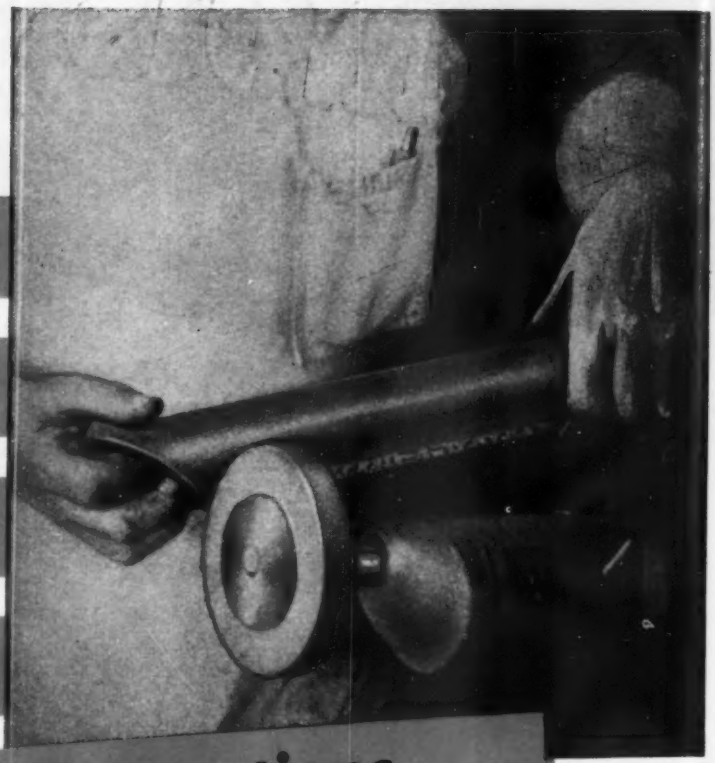
ILLINOIS
TOOL WORKS

Manufacturers of Metal Cutting Tools and Shakeproof Products

2501 N. KEELER AVE., CHICAGO 39, ILLINOIS

In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

Faster, Better DE-BURRING FINISHING POLISHING In Fewer Operations



Brightboy offers you outstanding time and work savings, plus quality, precision finish, because it is made of *resilient rubber*. The rubber is *impregnated throughout* with the abrasive.

In use, the abrasive recedes slightly into the rubber, cushioning the abrasive action. The degree of finish is achieved by regulating the machine speed, or in manual operations, the hand pressure. Brightboy's versatility and working simplicity eliminate many in-between operations; a Brightboy finish frequently serves as the final polish. The waste *drops*, just like eraser crumbs; doesn't fly. No special setups are required.

Ask your distributor for Methods and Application Data, catalogs and prices. Brightboy field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIVISION

WELDON ROBERTS RUBBER CO. **NEWARK, N. J.**

AVAILABLE IN 3 TEXTURES:

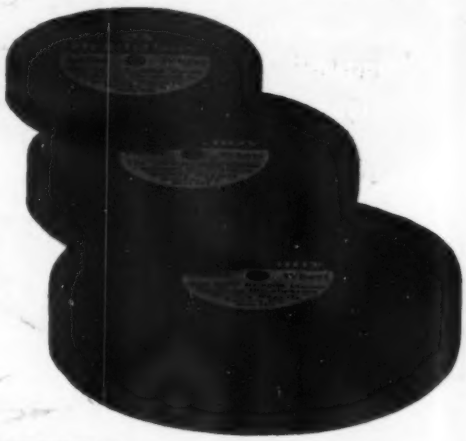
BRIGHTBOY STANDARD for all around metal finishing.

BRIGHTBOY FINE-TEX for lighter work — for fine polishing.

BRIGHTBOY TUFF-TEX for harder metals.

Outstanding Work Advantages of Brightboy
for All-in-One DE-BURRING FINISHING, POLISHING

- *Bridges the gap between a grind and a buff.*
- *Does not load, gum or fill.*
- *Works with minimum dimensional loss.*
- *Requires no special preparation.*
- *Made in wheels, blocks, sticks, rods — for manual and machine operations.*



WELDON ROBERTS

Brightboy

REG. U.S. PAT. OFF.

★ HERE'S HELPFUL INFORMATION FOR YOU ★

JESSOP TOOL STEEL

Technical Data

★Analysis, applications, working data, and other helpful information are presented in these folders published by the Jessop Steel Company. They will help you use your tool steels with maximum effectiveness. This information available to you without obligation, combined with the metallurgical experience and Quality Control which goes into every Jessop product, means added insurance of maximum performance.

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Established 1901

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☐ C.N.S. (Air-Hardening) ☐ R.T.S. (Water-Hardening)
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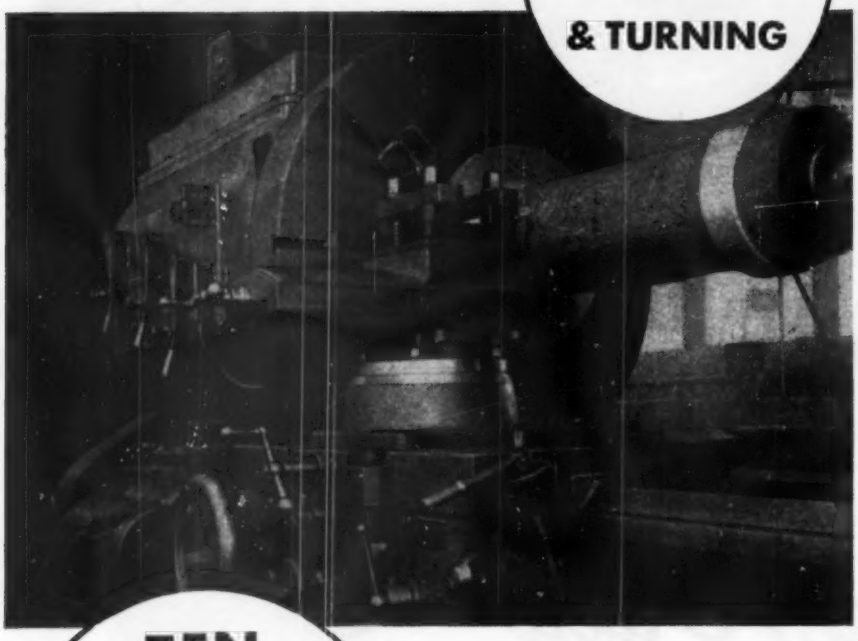
Sommerfeld

(Formerly Pittsburgh)

LATHES

TURNING
* * *
BORING & TURNING



TEN WEEKS DELIVERY
NOW POSSIBLE ON 50 or 60 INCH UNIT

This powerful lathe might be called the "Double-Time Worker" because it bores and turns simultaneously—thus practically cutting in half, your set-up and working time, your floor-space requirements, your capital investment and your labor requirements.

The operating improvements and refinements found in Sommerfeld Lathes have come out of thirty years' experience in the lathe business.

At the present time, we are in position to quote ten weeks delivery from receipt of order (subject to prior sale) on either the 50 inch or 60 inch lathes, either turning only, or combination boring and turning.

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895

Your Choice
of an Arc Welder should be governed by these...
8 PRIME FACTORS

Hobart
"Simplified" Arc Welder Gives You Every Advantage and proves it can win on every count.

Now is the time to "get set" to meet the new competition that Arc Welded products are certain to give you. No production process has forged ahead as Electric Arc Welding—no process is easier to take advantage of. Now is the time for you to plan for welding and HOBART use gives it outstanding advantages for the machine you must consider. Write us for details and catalog.

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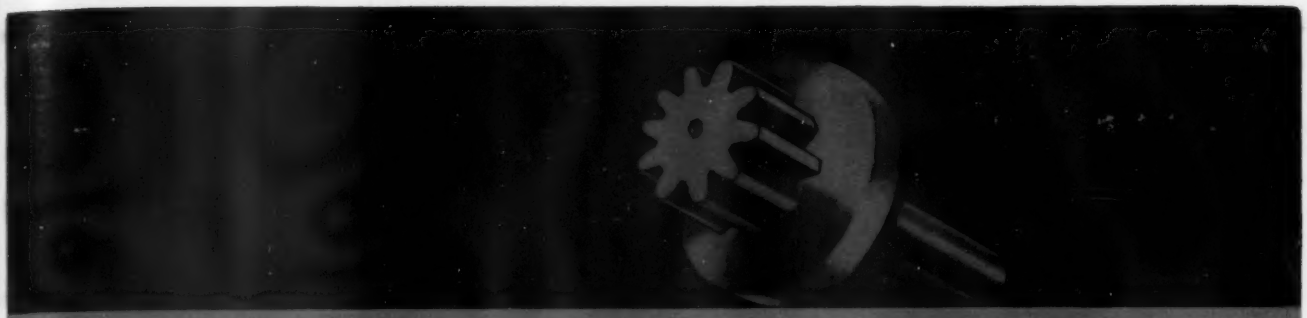
HOBART
"Simplified"
ARC WELDERS

HOBART
"One of the World's Largest Builders of Arc Welders"



Gulf Super-Quench

solves another heat-treating problem—

Here are the results on gears of a prominent machine tool manufacturer:

1 Gear hardness increased from 35 Rockwell C to 44 Rockwell C

2 Soaking time in cleaning bath reduced from 30 minutes to 5 seconds

3 Hand brushing and cleaning operation eliminated

4 Substantial increase in production

You tap a new source of greater production efficiency when you put this revolutionary new quenching oil on the job in your plant

A large machine tool manufacturer, securing only 35 Rockwell C hardness on spur gears with a conventional quenching oil, adopted the recommendations of a Gulf Service Engineer to use Gulf Super-Quench.

This revolutionary new quenching oil quickly demonstrated its super quenching power. Rockwell C hardness was increased to 44. In addition, bath cleaning time was reduced from 30 minutes to 5 seconds—and a subsequent hand cleaning operation was eliminated. Another tough heat-treating problem solved and production stepped up with the help of Gulf Super-Quench

It will pay you to investigate this remarkable quenching oil—call in a Gulf Service Engineer and let him demonstrate how it can help you improve your heat-treating practice. For your copy of the new brochure on Gulf Super-Quench, send the coupon below.

For Victory—
buy United States
War Bonds
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GULF INDUSTRIAL LUBRICATION

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3800 Gulf Building, Pittsburgh, Pa.
Please send me, without obligation, a copy of the new brochure, "Gulf Super-Quench."

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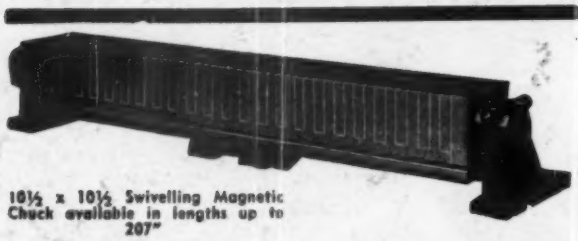
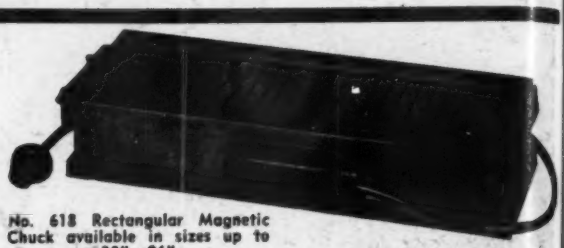


18½ x 18½ Swivelling Magnetic Chuck available in lengths up to 207"



No. 618 Rectangular Magnetic Chuck available in sizes up to 30" x 96"

Your every need can be met with

WALKER MAGNETIC CHUCKS

DEMAGNETIZERS

Send for a copy of Bulletin K7 giving complete information on Walker D.C. and A.C. Demagnetizers. These units —in 110 and 220 v.—are suitable for removing residual magnetism from a wide variety of work, are convenient and highly efficient.

Aside from the fact that Walker Magnetic Chucks are of tried and proved design and construction, the big advantage in coming to Walker for your needs is the fact that you can be certain that you will exactly meet your needs. Regardless of your requirement, there's a Walker to handle it.

The completeness of the Walker Magnetic Chuck line makes it possible for you to standardize on these well-known and widely accepted units. Every type of magnetic chuck is available in a wide range of standard sizes including Rectangular, Swivelling, Vertical Face and Rotary. Every design is modern, convenient, with maximum uniform magnetic strength over the entire surface.

Get all the details pertaining to sizes, types and construction by wiring today for a copy of Bulletin W4.

Also

Walker is prepared to furnish promptly and at reasonable price any special magnetic chuck that may be required for special service conditions. Outline your problem and ask us to submit details and quotations.

Style B Face Plate for Standard Rotary Type Chucks available in sizes up to 66" diam.

No. 410 Universal Swivelling Magnetic Chuck

O. S. WALKER CO. Inc., Worcester, Mass.

Now we are turning out special cutting tools of many types for an army of defense plants. Later we will be ready for postwar tooling problems with new methods we have learned, for better, faster work.

Note: We manufacture no tools for stock. Send us your inquiries for prompt estimates. Bulletin 201 on request.

Certain attractive territories open for active agents.

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AMERICAN CUTTER

AND ENGINEERING CORP., WARREN, MICH.

SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

Cartridge Case Dies

. . . WITH TALIDE NIBS made of Solid Tungsten Carbide, are producing millions of primer cups, small arms ammunition cases and jackets, and cartridge cases in sizes 20 m/m to 105 m/m with Better Finish, Longer Life, Closer Tolerance and Fewer Rejects . . . including cupping, drawing, tapering, sizing and pointing operations.

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TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

Flap Transmission for an Aerial Freighter

Due to our wide experience in the field of aircraft hydraulic actuators, one of the nation's leading aircraft builders called on us to design and build a mechanism to operate the wing flaps on one of their large cargo planes. These flaps are used for maneuvering and braking the plane during a landing and the control is extremely sensitive. A very special mechanism was needed, light, as there are fourteen of them in the wing, and strong enough to withstand unusually high torques.

VARD engineers developed this wing flap transmission. A row of these small gear boxes is linked together by splined shafts, running out of a central transmission in the fuselage. Flaps are extended or retracted by chain drives from the individual transmissions in line.

For years, VARD has built precision aircraft parts and gages, but few pieces of aircraft equipment which we have built top this small transmission for critical accuracy. Despite its small size, it handles an unusually high load through a forty-five to one gear reduction. The unit contains chain sprockets, a worm and a worm gear and zerol bevel gears, all carried on ball bearings. Tolerances are at a very minimum, as there can be no slack in the whole transmission system.

We designed and are building this transmission complete, making every part except nuts, bolts and ball bearings. It has been fully tested by the plane manufacturers and declared a good job.

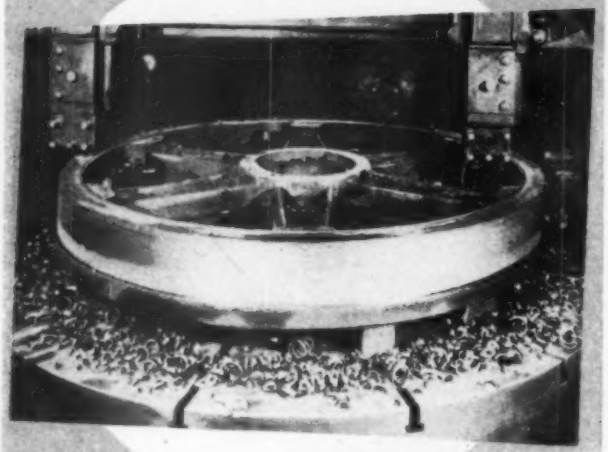
VARD INC. PASADENA, CALIFORNIA

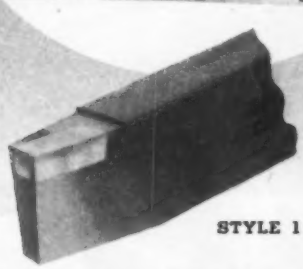
ARMY E NAVY

KENNAMETAL CARBIDE TOOLS

Operate Efficiently

AT NEW MACHINE TOOL CAPACITIES





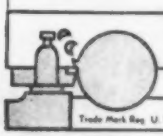
STYLE 11

Today's rugged high-powered machines permit production volumes previously thought impossible by the metal-cutting industry. However, maximum production can be attained only when steel-cutting tools are capable of operating efficiently at rates equalling machine tool capacities.

The superior strength and hardness of KENNAMETAL carbide tools enable them to meet successfully the demands of stepped-up production and permit these high capacity machines to achieve the maximum output for which they are designed. KENNAMETAL not only handles normal machining operations at extremely high speeds but has the added advantage of being able to take intermittent or jump cuts and to "hog" through hard, scaly-surfaced steels up to 550 Brinell.

Write for the new KENNAMETAL Catalog 43-C. It covers in detail such information as grade characteristics, style selection and proper tool care.

KENNAMETAL THE All American CARBIDE



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MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

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ADJUSTABLE LIMIT

SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

Send for Folder

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RESULTS *that* COUNT

• All production today must fit America's pressing war needs... ordnance, munitions, and machines must be on their way as quickly as possible.

Measured in terms of results that count, En-Ar-Co PROMAX Cutting Oils are vital factors, in hundreds of plants, in stepping up production as much as 75 per cent.

National Refining Industrial Engineers are at your service.

EN-AR-CO PROMAX CUTTING OILS

This big book, with over a hundred illustrations, is *free* for the asking. Write for your copy today.

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For SURFACE GRINDING

This 846 K-1 Dayton Grinding Wheel is Doing a Whale of a Job for Hundreds of Users.

Example No. 1. Surfacing mild steel on hydraulic grinder—giving maximum stock removal with a minimum of wheel wear.

Example No. 2. Precision grinding of hardened steel parts—with high production efficiency and giving excellent finish.

Example No. 3. Many users of this wheel have found it ideal for surfacing varied materials, saving time usually required to change wheels.

If you have a problem in surfacing or any other grinding that you haven't solved to your complete satisfaction, we may have the answer.

Write, wire, or phone—giving us an outline of your problem—and one of our experienced engineers will serve you promptly and efficiently. We may have what you need in stock.

Dayton Grinding Wheels

Simonds Worden White Company

712 Negley Place, Dayton, Ohio

Is this YOUR Cleaning Problem?

REMOVING ANODIZING FILM FROM ALUMINUM WORK RACKS

Now you can do this EFFECTIVELY, SAFELY, EASILY! Simply immerse racks, straps and hooks in the recommended solution of Oakite Compound No. 84. Not only is all anodizing film removed, but full electrical conductivity is restored without injuring basis metal or causing dimensional changes.

You can also use the same SAFE, THOROUGH, FAST Oakite method for deoxidizing rejected parts. For further information on these TWO jobs, send for your FREE copy of a NEW, 12-page manual. Write TODAY!

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DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing.

● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

6 Days' Delivery

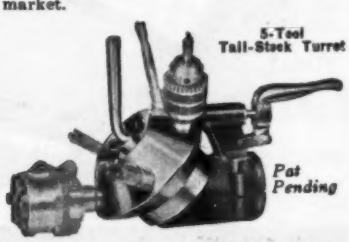
Pat Pending

4-Tool Tool-Post Turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below, right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.

5-Tool Tail-Stock Turret



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● ALSO—*Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.*

Immediate Delivery

JEFFERSON MACHINE TOOL CO.

SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI, OHIO

DALZEN *Broaches*

ROUND AND FLAT . . . IN A COMPLETE SIZE RANGE

For maximum parts per grind plus maximum grinds per broach specify Dalzen broaches.

Dalzen broaches are ground from your blueprints by precision craftsmen with years of experience in broach making. Flat broaches are available in any size; round broaches, in any size up to 72".

When ordering, give make and number of machine, length of stroke, and type of holder.

A DALZEN WILL DO IT! Dalzen tools — taps, flat and round broaches, thread milling hobs — have the same high reputation for accuracy and dependability as Dalzen Thread Grinders and Center Lapping Machines. Sturdy, compact, efficient, Dalzen machine tools give maximum production per cubic foot, per pound, per dollar of cost! Write for descriptive literature.

DALZEN IN AIRCRAFT

Ground thread parts are being produced to contract for leading aircraft engine manufacturers. For detailed data on this service, submit blueprints and specifications when making inquiry.

DALZEN

TOOL & MANUFACTURING CO.

12255 EAST 8 MILE ROAD • DETROIT

Critical Broach Saved by "HARDSTEEL" DRILL—

When a tool that has cost hundreds of dollars and will take weeks or months to replace breaks, it is nothing short of a calamity . . . Production stops. One operation down may stop an entire production line. • The big broach illustrated broke through the slot in use . . . It was full high speed steel, yet with "HARDSTEEL" Drills it was possible to drill three ½-inch holes through the shank and put the broach back into service with very little delay . . . A new broach would have been months in the making. • Keep an assortment of "HARDSTEEL" Drills in your shop . . . You never know when they will save you time and money . . . whenever steel hardened to Rockwell "C" 40 or higher by any process must be drilled.

Fine for salvage operations, equally good for production operations where full hardened steel parts can easily be drilled to match at assembly.

Write today for your copy of the "HARDSTEEL" Operator's Manual.

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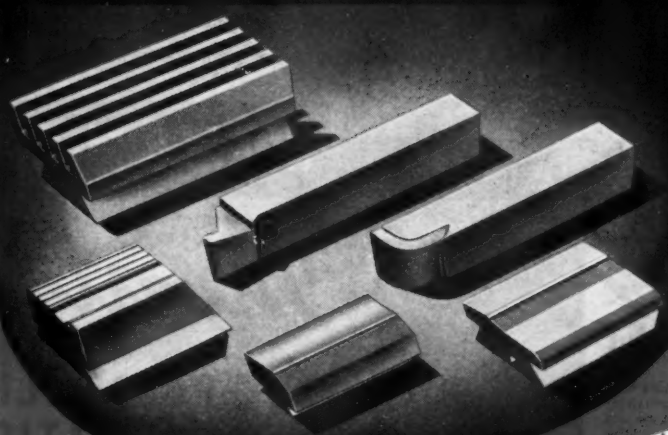

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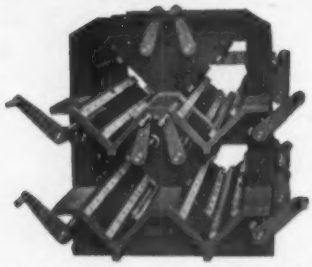
HOEFER Two-Deck Fixture Speeds Machining ..Drilling and Tapping.... of 3 different sized cylinder heads for Diesel Motor



DRILLING 7/16 — 55' per minute, 475 r.p.m. .006 feed, one minute.
7/16 — 56' per minute, 390 r.p.m. .007 feed, one minute.

TAPPING 21' a minute, 213 r.p.m. forward and reverse, complete cycle 30 seconds.

TAPPING 22' per minute, 173 r.p.m. complete cycle 30 seconds.

★ The view at left is of tunnel fixture designed to handle the drilling and tapping of three different sized cylinder heads on Diesel Engines, for bolting on flanges of manifolds. The upper deck, right and left, takes care of drilling and tapping one size cylinder head while lower deck takes care of two additional sizes with identical manifold hole layouts. Two 16-spindle heads, similar to one at right, were mounted on opposite ends to a two-way machine, fixture in the middle, right hand end drilling, left hand end tapping, with tapping reverse in machine — positive lead screw.

When you have more than one hole to drill, let HOEFER help you drill them to get the utmost in time savings and economy.

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MASTER STREAMLINE steel tape rules will fill the bill on jobs where accurate measurements are important. In addition to its extreme accuracy (accurate to .005") the MASTER STREAMLINE makes measuring a quicker, easier job. In cramped, dimly lighted spaces STREAMLINE'S pistol-butt case and lever-lock — to hold reading from work to eye—makes inside measuring a simple, one-hand job.

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EXTRA!—Write today for your free copy of "Rules for Measurement" — a 16-page, pocket size booklet crammed with facts and information on how to make your rules serve you better and longer.

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The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

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Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

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GEOMETRIC

Pointers

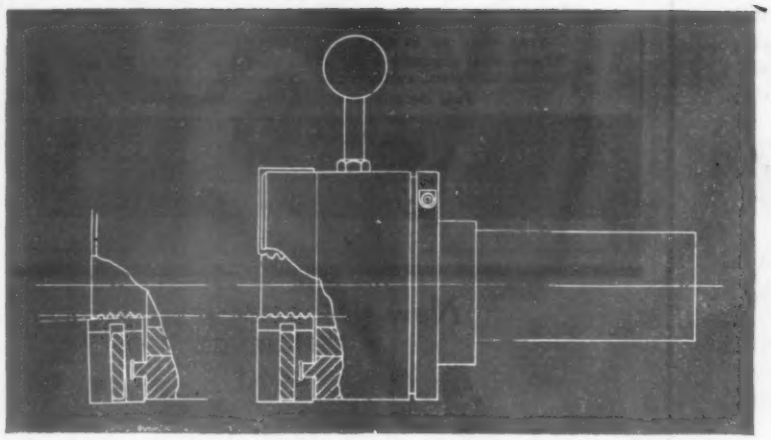
FOR SAVING HIGH SPEED STEEL

No. 11

Keep Your

DIE HEADS

in First-Class Repair



Worn chaser keys (left) throw your chasers off center, producing poor threads. Right-hand diagram shows chasers properly positioned, because keys are in good condition.

If you want to get the most out of your precious High Speed Steel chasers, you must keep your Die Heads in repair.

If your Die Heads or Taps are badly worn the chasers will not line up accurately with the work and you'll get taper threads, poor thread form — and perhaps even considerable chaser breakage.

Check particularly the body of the tool in which the chasers are held, also check the shank member of the tool. If it is out of round or badly battered or bent, it should be repaired or replaced.

Of particular importance in the "D" type GEOMETRIC Die Head are the chaser keys. As the chasers slide back and forth a few million times on these keys, they are bound to wear. When the wear is considerable, you get a bell-mouthed cutting condition as shown in the small left-hand section of the diagram above. You would expect poor threads from any tool in such condition — and that's what you'd get!

If the keys in Die Heads are badly worn, return the tools to the factory for repair. The Geometric Tool Company, New Haven 15, Connecticut.

The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies whose employees contribute at least 10% of their earnings, through the Payroll Savings Plan, for War Bonds. Buy War Bonds and Stamps each payday!

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CARBIDE TIPPED TOOLS
Price $1.00 Each In Any Size

New Low Prices—Increase Production—
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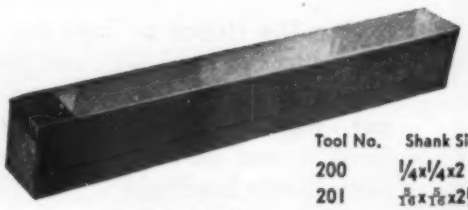
Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

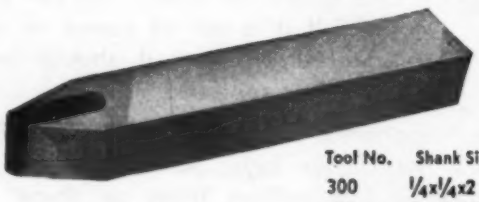
SERIES 100

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Standard Tungsten Carbide Tipped Tool Bits

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lots of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

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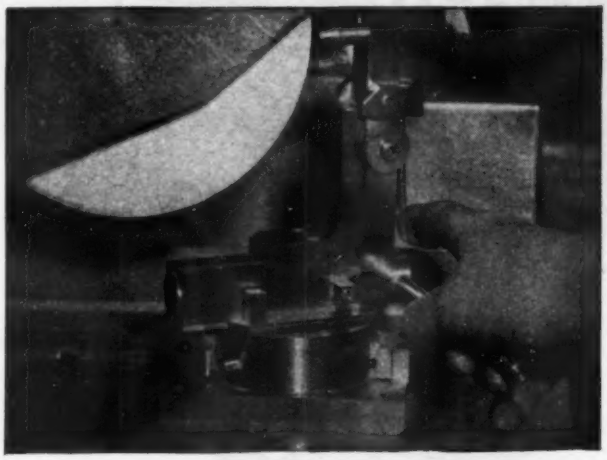

An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle
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Two angles and radius.
Many other diversified forms to meet requirements.

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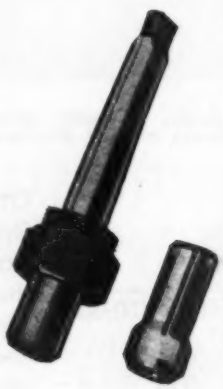

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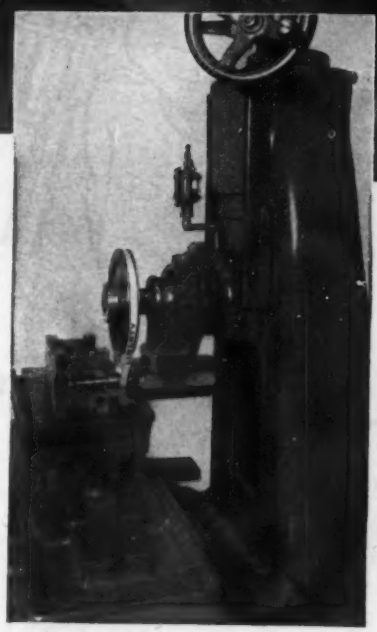
Liberty Attachments

Grinding a Difficult Keyway



This is Liberty Horizontal attachment No. 90-30 with collet chuck. It can be assembled to your surface grinder in 2 minutes without machining. It will do many intricate jobs which are otherwise impossible without this grinding attachment. The illustration shows the grinding of an inaccessible keyway. Liberty Attachments are available in Horizontal and Vertical models. They are adapted for use on many popular surface grinders. Can be had with solid quill or collet chuck. Hundreds of plants find them indispensable.

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No. 301 6" x 9" x 3½" 20 ga.....$ .55 Ea.
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A light weight box designed for quick identification of contents. Will stack with No. 303. Finished olive green enamel, baked on.

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A straight side shop box with drop handles each end. Excellent for shop use where stacking feature is not required.

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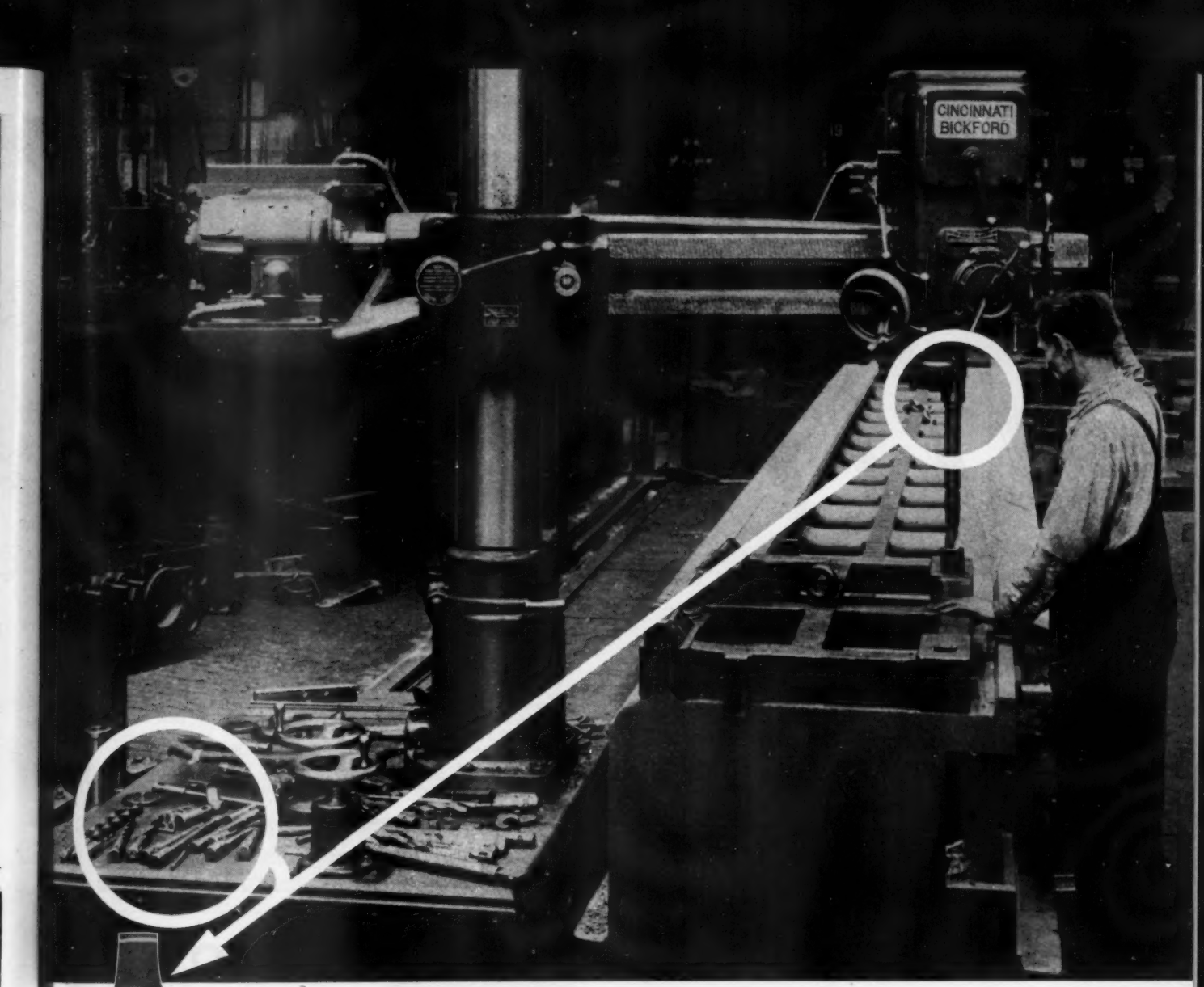

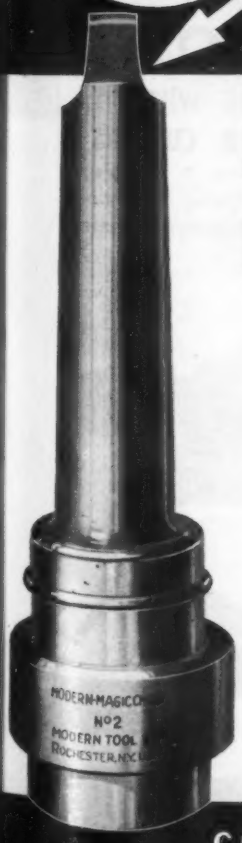

Keep Your Machines Running with MODERN-MAGIC Quick Change CHUCKS!

You don't have to stop or slow down spindles to change tools with Modern-Magic Quick Change Chucks. These highly efficient units permit tools to be changed with spindles revolving at operating speeds, thus allowing a sequence of operations to be performed with spindles revolving continuously. These chucks will accommodate different sizes of tools or group of tools and may be used on drill presses, lathes and other machines.

You can increase production tremendously by standardizing on Modern-Magic Quick Change Chucks and Collets. Bulletin 101 giving complete information on this equipment will be mailed on request. *Send for it.*

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MODERN TOOL WORKS

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So be sure to insist on "American Swiss" when you buy Pillar or other Swiss-Pattern files . . . obtainable from our Distributor . . . there's one near you.

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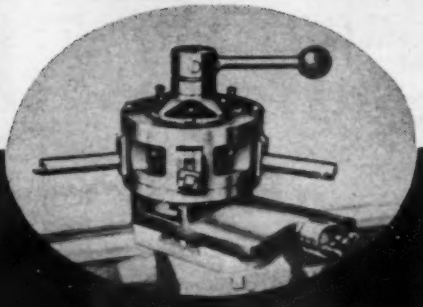

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EASILY APPLIED TO ANY ENGINE LATHE

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Available for any lathe from 9" to 30" swing, these heads are furnished ready for assembly. Inasmuch as tool bits already available can be used, no extras are involved.

Operation is exceedingly simple. A 1/8th turn of the handle and a lift of the handle to a 45° position releases turret head for turning in either direction to position desired. Head is rigidly held in any position. Absence of tool bit adapters also promotes rigidity for heavy cuts. Boring bars can be used in this head when desired.

Investigate the production speed-up possible through converting your engine lathes to turret operation through these heads. Send for Descriptive Bulletin, giving details of design and sizes available.

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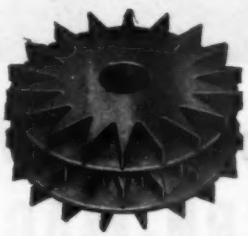

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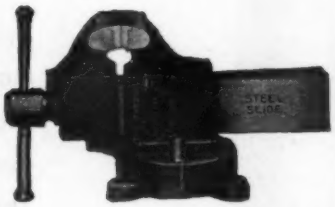
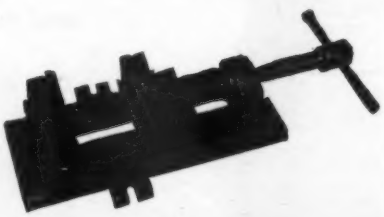


Write for copy of catalog "A" and name of your nearest dealer who can supply you.



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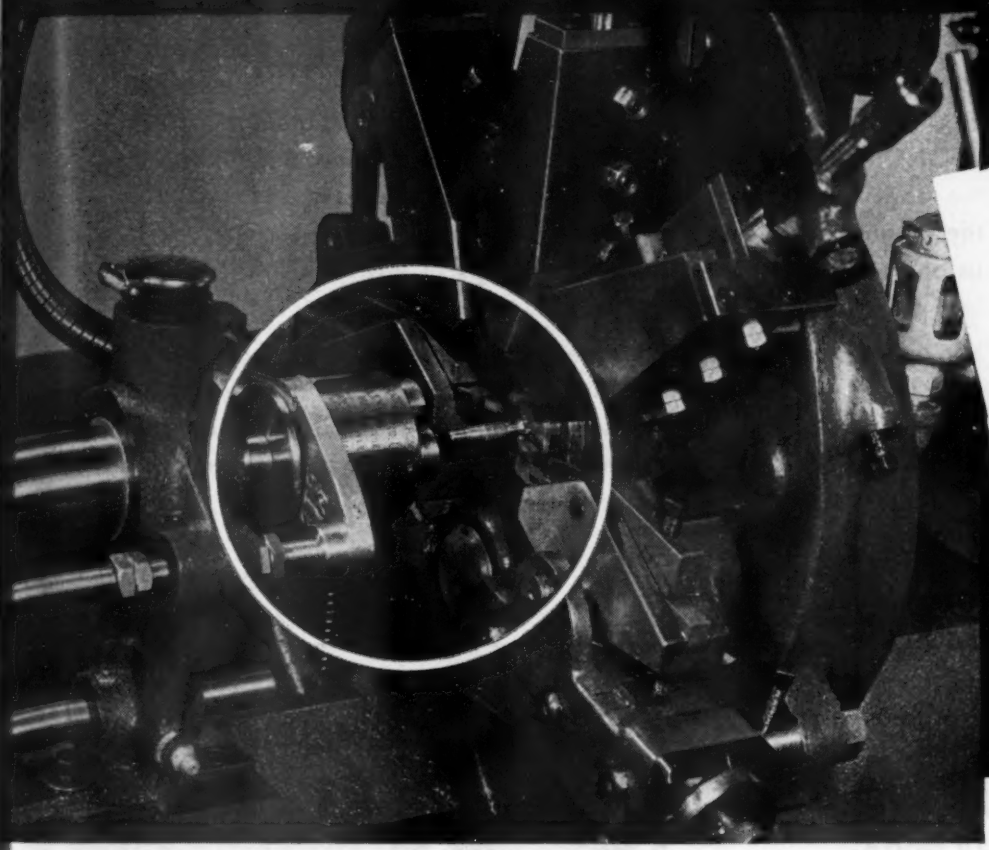


Namco Revolving Die Heads with Circular Chasers are standard equipment on

WICKMAN

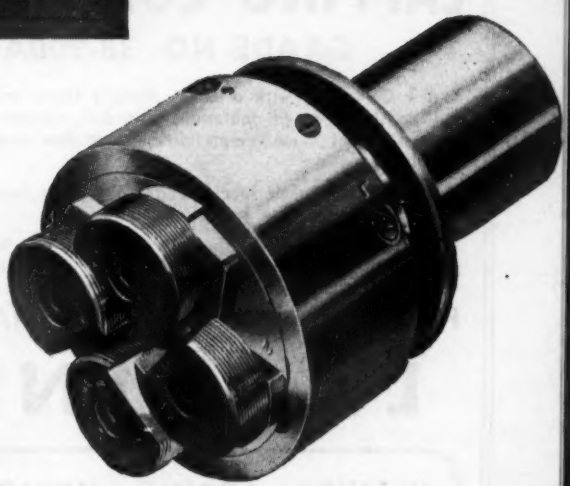
Automatic Screw Machine

If you are doing small work that demands speed, production and precise dimensions, you can depend on Namco Circular Chaser Die Heads for "toolroom accuracy" at high production output. Class 3 threads, too, without variation.

They save time, because all four chasers are adjusted simultaneously. Inserting a reground duplicate set is a 2-minute job—no trying for size, no work spoilage, less idle machine time—and precise dimensions maintained.

They cost less, because chasers may be reground through 270° of circumference—last 10 to 50 times longer.

Namco Circular Chaser $\frac{5}{16}$" Die Heads are available for many makes of automatic screw machines for making small parts.



Maximum Capacity Type DR 5/16"
Complete data in Catalog D-42

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170 EAST 131ST STREET • CLEVELAND, OHIO

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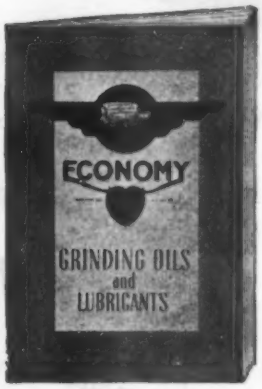
"Grinding Oils and Lubricants for Precision Grinding"

is the title of a book just published which you will find a source of valuable information. This book contains illustrations of grinding operations on which speed and precision in manufacturing are made possible through the use of ECONOMY GRINDING OILS and LUBRICANTS which have set new performance records in thousands of plants. This book tells you just how ECONOMY GRINDING LUBRICANTS (the water-soluble group) and ECONOMY GRINDING OILS, the newest contribution, are serving on the front lines of industry, and why these lubricants are specified for the toughest and newest problems confronting industry today. Write us on your company letterhead for a copy of this book and it will be sent promptly.



White & Bagley technical representatives are always ready to furnish complete details for your grinding problems. Let us know the types of machines operated, nature of work performed, and the kind of material ground, and we will recommend the oil or lubricant experience has shown to be the best and most economical.

THE WHITE & BAGLEY COMPANY Worcester, Mass. Detroit Minneapolis

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LAPPING COMPOUND
GRADE NO. 38-900A

A new Compound with a NEW abrasive sharp enough to lap and polish hardened materials, mitrided, chrome plate etc. Gages — Dies — Aviation Parts — yet fine eough for final finishing.

This compound has a special heavy oily paste base especially made for dilution with kerosene, spindle oils.

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A substitute for sperm oil on lapping operations.

Single gallon cans	$2.00 each
6 gallon order	1.75 per gal.

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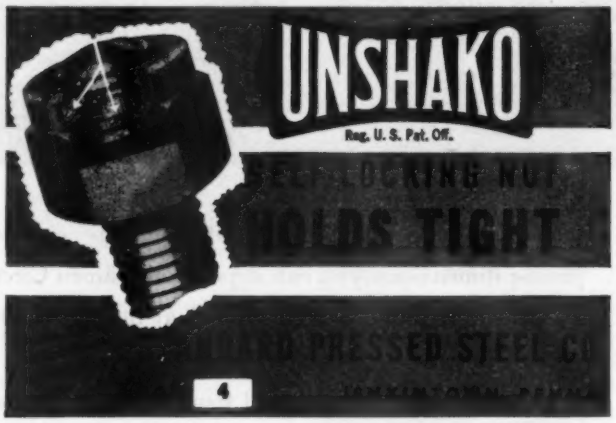

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HARDNESS TESTER

QUICK DELIVERIES
Shipment of normal type hand-operated machines can be made in less than a week.

NEW MODELS
are enormously improved.

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MECHANICAL INSTRUMENT CO. INC
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"We intend to fight it out on this line..."

•A Civil War General said it—"We intend to fight it out on this line if it takes all summer." We, the creators of "The Wheels of Industry", make the same pledge in the present conflict—we intend to fight it out on our production lines if it takes all winter, all summer—until war's end! Realizing that industry as a whole endorses the same pledge, we promise to keep the Sterling Grinding Wheel supply lines open. •Industry relies upon grinding wheels. Without them, tanks, planes, guns, trucks, ships—nothing could be produced in such short time.

The name—*Sterling*—on a wheel means a unit especially built to solve your production problems.

•Perhaps, you have problems of war production that demand quick solution. If so, Sterling engineers have many ideas to speed up grinding and help you accelerate output.

•Every grinding job demands different wheels . . your request for assistance may result in faster, better results without adding a man to your industrial fighting line. Write today!

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STERLING GRINDING WHEEL DIVISION

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TIFFIN, OHIO

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To check accurately the exacting specifications of the high speed steels used in WELDON cutting tools, exhaustive chemical and physical tests are made by a staff of highly trained experts in the WELDON metallurgical laboratories.

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We can make immediate shipment of most sizes of WELDON End Mills. Write for stock list.

THE WELDON TOOL CO. *Cleveland 4, Ohio*

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Type "G" (non-rotating) SELF-OPENING DIE HEAD—Designed and engineered for use on any machines where die heads do not rotate. Made in sizes from 7/16" up to and including 6".

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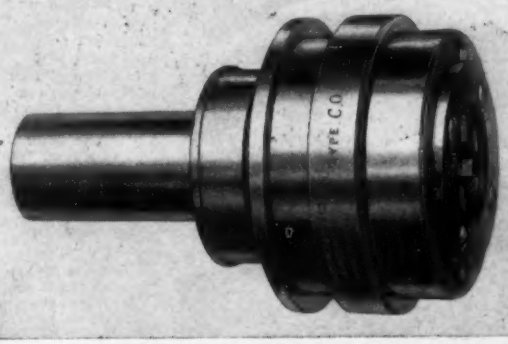

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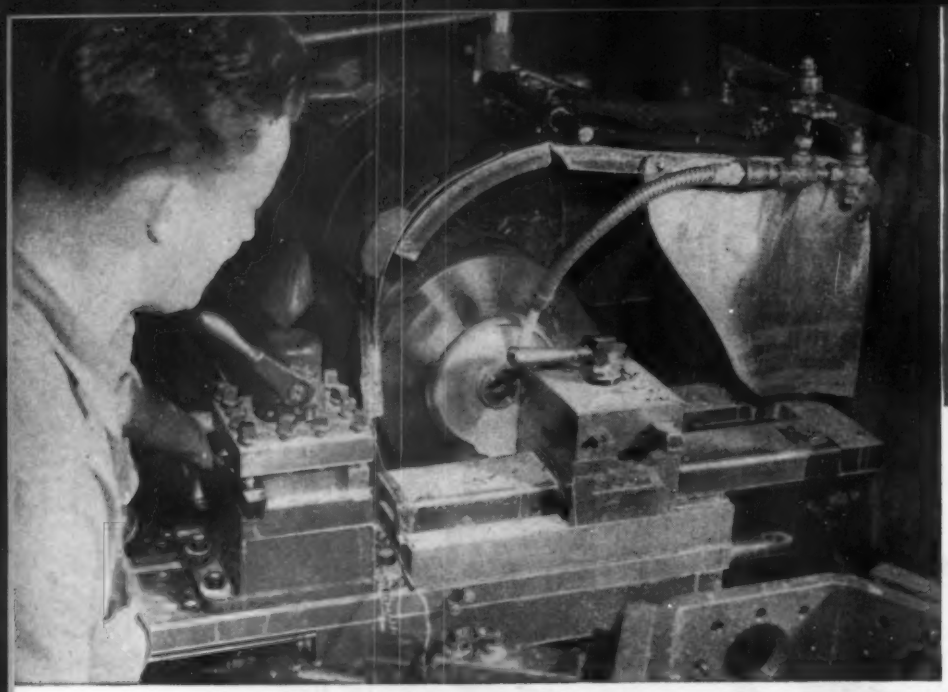

Guide t when

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When carbide tools are correctly used, vital production time is saved! In the machining of this steel gear for superchargers, Carboloy tools, cutting at 220 F.P.M., save 81% of time formerly required. Carbide tools face, turn, bore, form, undercut and chamfer . . . and eliminate an extra pass of tools across work.

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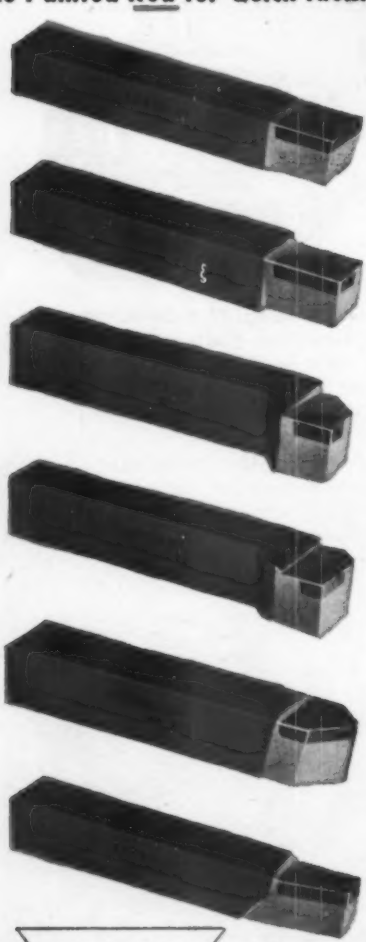
General Purpose Standards for Turning, Boring, Facing

hanks Painted Red for Quick Identification



Style T-1. Square nose general purpose turning, boring, facing tool—13 stock sizes.

Style T-7 (left hand) shown—Style T-4 (right hand) available—16 stock sizes.

Style T-9 (left hand) shown—Style T-5 (right hand) available—8 stock sizes.

Style T-11 (left hand) shown—Style T-10 (right hand) available—8 stock sizes.

Style T-12. Round nose general purpose turning, boring, facing tool—5 stock sizes

Style T-14 (left hand) shown—Style T-13 (right hand) available—14 stock sizes.

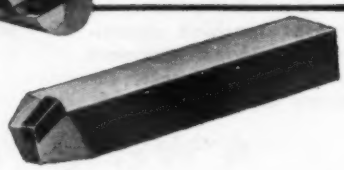
Other Standards

BORING TOOLS

Standard round shank boring tools for precision boring. Stocked in sizes from ⅜" dia. to ½" dia.

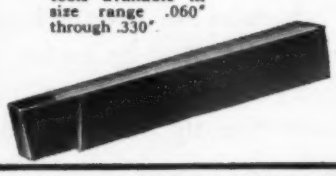
SHEAR TYPE TOOLS

For interrupted cutting on large forgings, castings, etc. Stocked in four sizes.



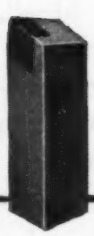
GROOVING TOOLS

Standard grooving tools available in size range .060" through .330".

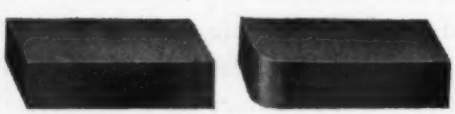


ROLLER TURNERS (BOX TOOLS)

Standards for Warner & Swasey and Gisholt turret lathes.



GENERAL PURPOSE STEEL CUTTING BLANKS



145 different blanks available for rapid delivery. For fast emergency tooling make your own tools.

***See Catalog GT-142 for Prices and Specifications of Over 300 Carboloy Standard Tools and Blanks**

TUNGSTEN CARBIDES For Cutting CAST IRON and Non-Ferrous Metals

CARBOLOY

(TRADEMARK) CEMENTED CARBIDES

TITANIUM TANTALUM CARBIDES For Cutting STEEL

FOR HEAVY HOGGING . . . PRECISION FINISHING . . . INTERMITTENT CUTS

to Top Performance CUTTING STEEL

For top performance when you cut steel with carbide tools ★ cut at high speeds, in general, not less than 200 feet per minute ★ Use feeds not less than .010″ per revolution (for medium and heavy cuts), and preferably .015″ to .025″ ★ Fit correct chip breaker to each job (the ground-in, step-type is usually best) ★ If you use a coolant, provide heavy, continuous stream ★ Keep tools sharp (excessively dull tools cause breakage) ★ Use rigid set-ups; with minimum overhang, and part chucked firmly. These factors are particularly important for best results when cutting steel.

Important, too, is the type of carbide you select. Today, more than 60% of all Carboloy Cemented Carbide produced for machining purposes is used for cutting steel. In leading war plants throughout the nation—you find Carboloy tools giving top performance on all types of steel cutting, ranging from extra heavy jobs to light, high-speed precision finishing.

A new 16-page pocket manual on steel cutting, to help your plant get maximum results, is available free on request. In quantities, for general distribution, if desired.

Guide to
CARBIDE GRADES & CUTTING SPEEDS

Chart at right shows suggested carbide grades and cutting speeds for average conditions. When conditions are excellent (good rigidity, etc.), Grade 78 may be substituted for 78B in column 2, and Grade 831 for 78 in column 4. Adjustments in cutting speeds may be made upward (for steels under 200 Br.) and downward (for steels over 300 Br.) within a 25%-30% range of speeds shown. For steels 400 Br. and over, use speeds 50% less than speeds shown.

STEEL TO BE CUT		FOR AVERAGE WORK									
		Col. 1		Col. 2		Col. 3		Col. 4		Col. 5	
		3/16″ to 3/4″ Cut .020″ to .030″ Feed		3/16″ to 3/4″ Cut .015″ to .025″ Feed		3/64″ to 3/32″ Cut .010″ to .020″ Feed		1/64″ to 1/16″ Cut .008″ to .012″ Feed		.005″ to 1/64″ Cut .002″ to .008″ Feed	
		Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade
Carbon	S.A.E. 1010-1025	250	78B	300	78B	375	78	500	78	675	831
	S.A.E. 1030-1095	200	78B	250	78B	300	78	400	78	550	831
Free Cutting	S.A.E. 1112-1120	250	78B	300	78B	375	78	500	78	675	831
	S.A.E. X1314-X1340	225	78B	275	78B	350	78	450	78	600	831
Nickel Mn	S.A.E. T1330-T1350	175	78B	200	78B	250	78	350	78	475	831
	S.A.E. 2015-2320	225	78B	275	78B	350	78	450	78	600	831
Nicrol Chrom	S.A.E. 2330-2515	200	78B	250	78B	300	78	400	78	550	831
	S.A.E. 3115-3140	200	78B	250	78B	300	78	400	78	550	831
Cr. Mo	S.A.E. 3145-3450	175	78B	200	78B	250	78	350	78	475	831
	S.A.E. 4130-4820	175	78B	200	78B	250	78	350	78	475	831
Cr. V.	S.A.E. 5120-52100	175	78B	200	78B	250	78	350	78	475	831
	S.A.E. 6115-6195	175	78B	200	78B	250	78	350	78	475	831
	S.A.E. Cast Steel	200	78B	250	78B	300	78	400	78	550	831

USE OF CHIP BREAKER

Fit each chip breaker to the job. Ground-in, step type shown at left is usually best. Chart below shows recommended width "W". (Breaker depth of .020″ generally satisfactory).

FEED → In. Per Rev.		.008-.012	.013-.017	.018-.022	.023-.027	.028-.032
Depth Cut Inches	1/64-3/64	1/16	5/64	3/32	7/64	1/8
	1/16-1/4	3/32	1/8	5/32	11/64	3/16
	5/16-1/2	1/8	5/32	3/16	13/64	7/32
	9/16-3/4	5/32	3/16	7/32	15/64	1/4

6 Carboloy Training Films Available for Use in Your Plant.

SEND FOR THIS FREE POCKET MANUAL →

Just off the press, a 16-page pocket manual on cutting steel with carbides. Shows how to determine correct rakes and angles, tool nose radius, cutting speeds, carbide grades, chip breakers. Contains guide to machine requirements, best use of coolants, and two pages of illustrated "Do's and Don'ts" for operators using carbide tools. Free upon request. Quantities available for plant distribution.

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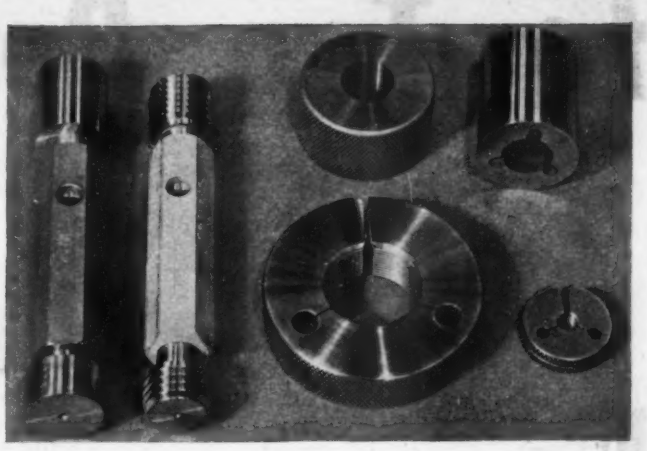

● Merz standard, plain and threaded, plug and ring gages are manufactured under ideal conditions for extreme accuracy. They are made by skilled craftsmen, in a plant that was built and equipped for the exacting requirements of this industry. There are none better on the market, anywhere, and prices are competitive.

This company offers a complete engineering and tooling service. Standard gages are shipped promptly from stock; special gages and tools are designed and made to order; precision products and parts are manufactured on contract. Write for illustrated literature, "4 Spheres of Service To American Industry," just off the press.

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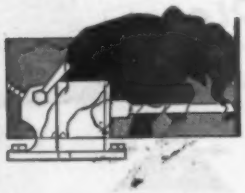

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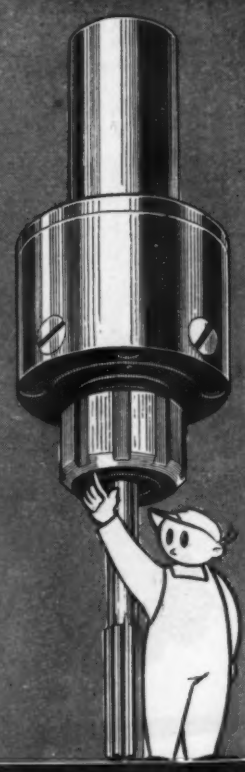
Universal Floating Chucks are the ideal tools for drilling, counter-boring, reaming or piloting from a lead hole. Adjustable spring pressure compensates for tool weight, allowing increased feed without danger of marred holes. Designed for horizontal operation in screw machines and turret lathes. Write for facts on Universal Floating Chucks, Standard Chucks and Centering Chucks.



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The New Tool

FOR FASTER MILLING • MORE PIECES PER GRIND
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TANTUNG SHELL END MILLS

PRODUCTION GOES UP WITH THE USE OF
TANTUNG *"THE MIRACLE METAL"*

TANTUNG SHELL END MILLS WITH BRAZED BLADES

DIMENSIONS OF TANTUNG SHELL END MILLS							No. of	Size of
A	B	C	D	E	F	H	Teeth	Tips
2	1⅜	.750	⅝	.322	3/16	1 1/16	8	3/16 x ⅜ x 1⅜
2½	1⅝	1.000	⅞	.385	7/32	1⅜	10	3/16 x ½ x 1⅝
3	1¾	1.250	1.	.510	9/32	1 21/32	10	¼ x ½ x 1¾
3½	1⅞	1.250	1⅛	.510	9/32	1¾	12	¼ x ⅝ x 1⅞
4	2¼	1.500	1¼	.635	⅜	2¼	12	¼ x ⅝ x 2¼

The Tantung Shell End Mills listed above are standard right hand cut and are held to standard tolerances. These shell end mills are designed for faster milling and will produce more pieces per grind. The keen, durable cutting edge guarantees finer finish on work.

QUOTATIONS WILL BE FURNISHED ON REQUEST

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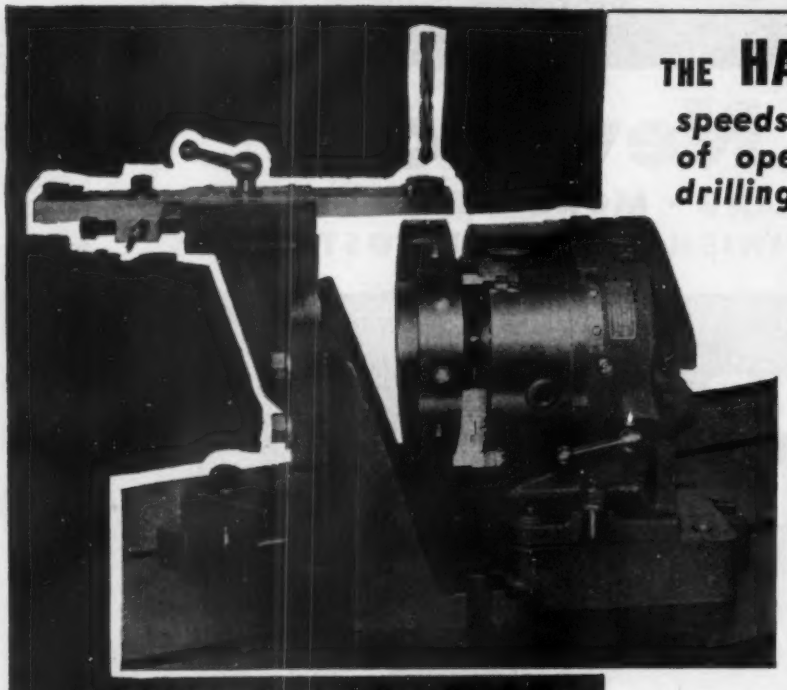

The Radial Drilling Attachment shown above is easily attached to any Hartford Super-Spacer to speed up operations. Variations in diameter and length of holes are easily handled. Utmost accuracy is assured.

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Applied to milling, slotting, planing and drilling operations, the HARTFORD Super-Spacer provides accurate control of indexing. With mask plates removing all possibility of error, indexing is fast, rapid and positive. A holding capacity, limited only by the capacity of the SUPER-SPACER itself, assures maintained accuracy under heavy cuts.

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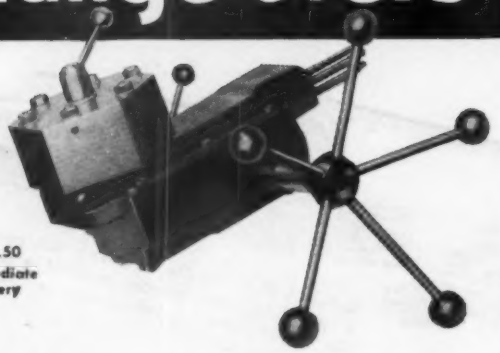

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Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

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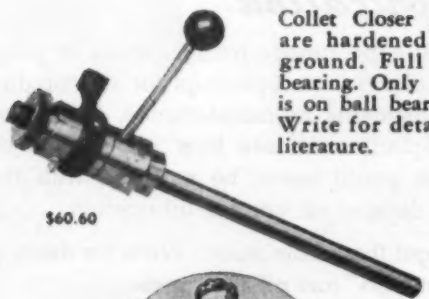

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*Micron—1/1000 of a millimeter.

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See our Advt. on page 190, July 22, '43 American Machinist

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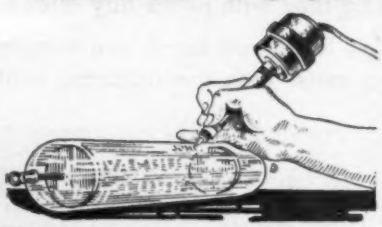

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THE NEW *Knock-Out* UNIVERSAL TOOL GRINDER

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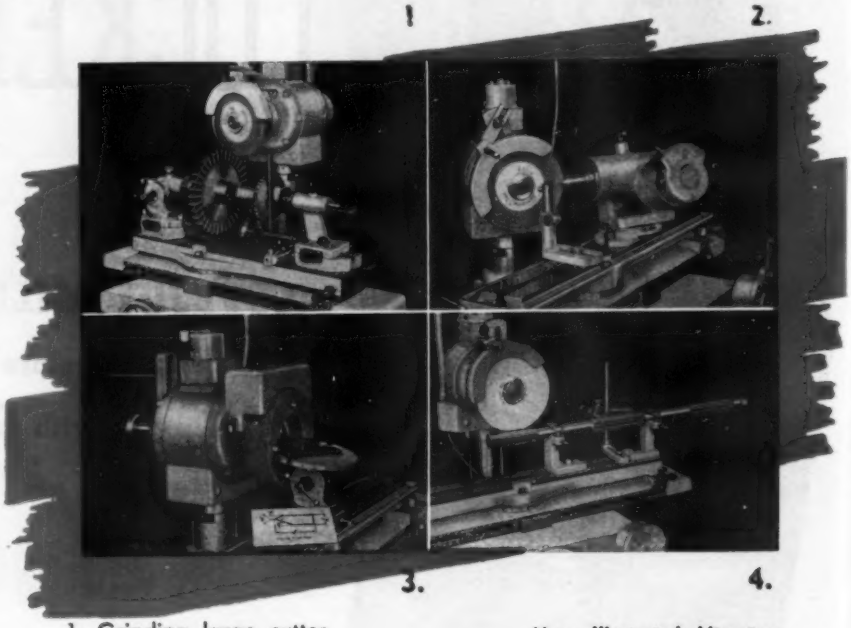
Model B600



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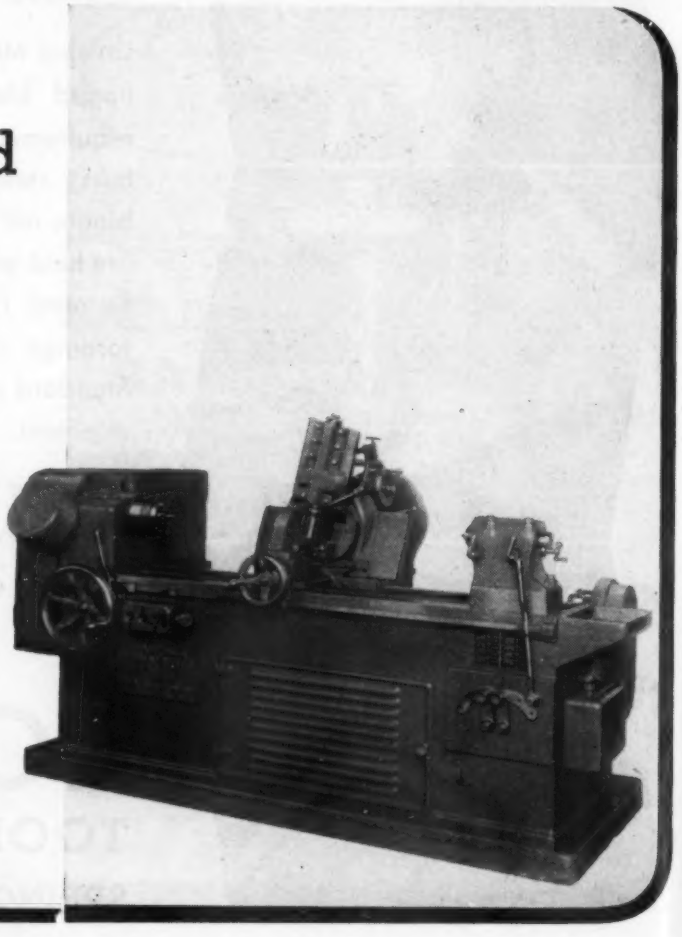

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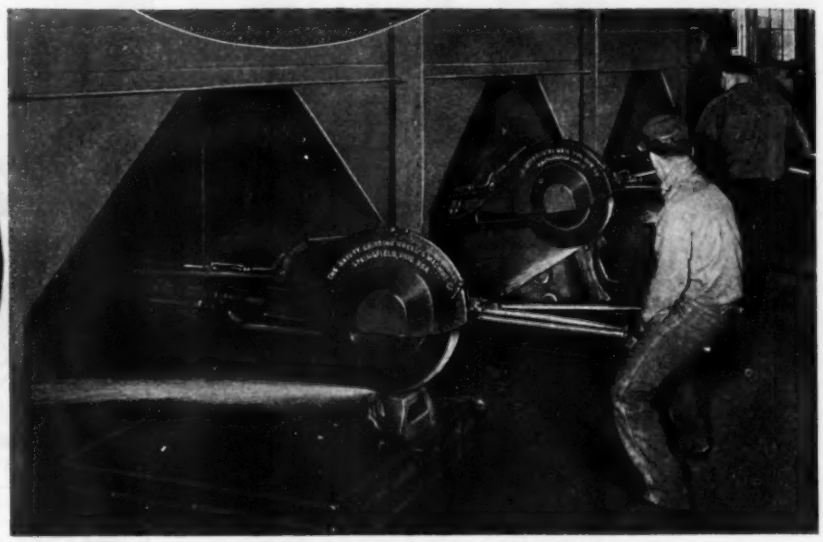

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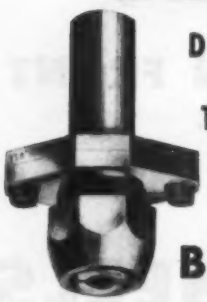

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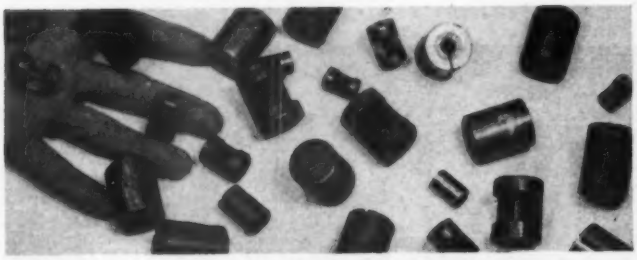

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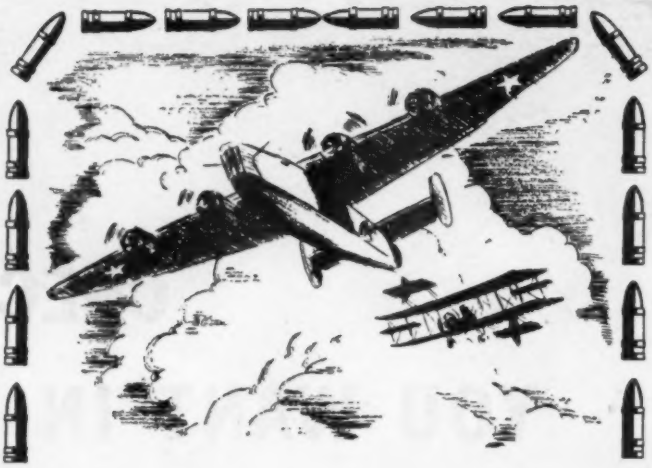

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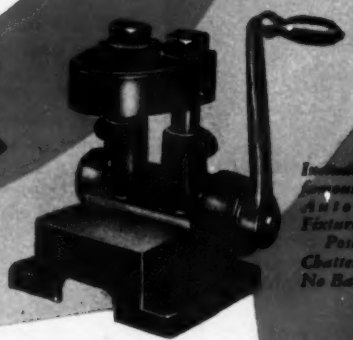

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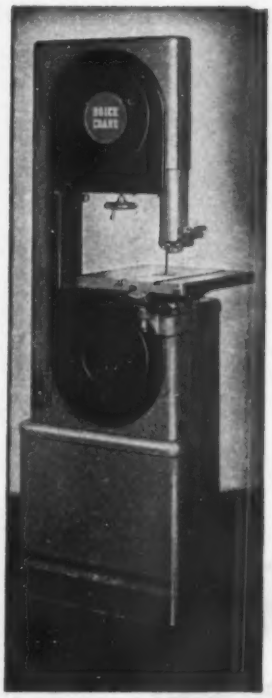

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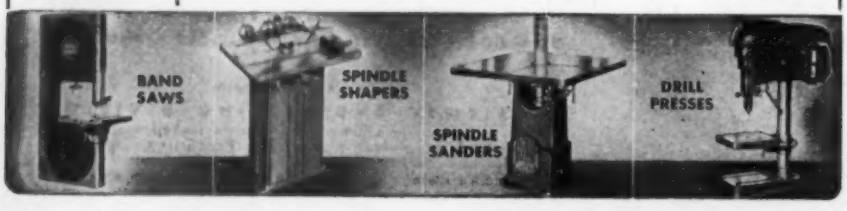

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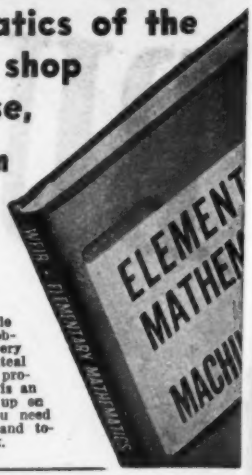

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—direct and inverse proportion
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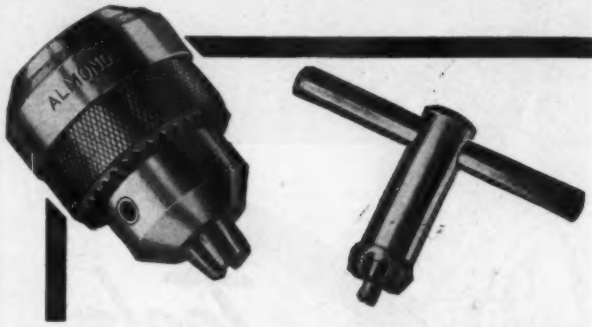

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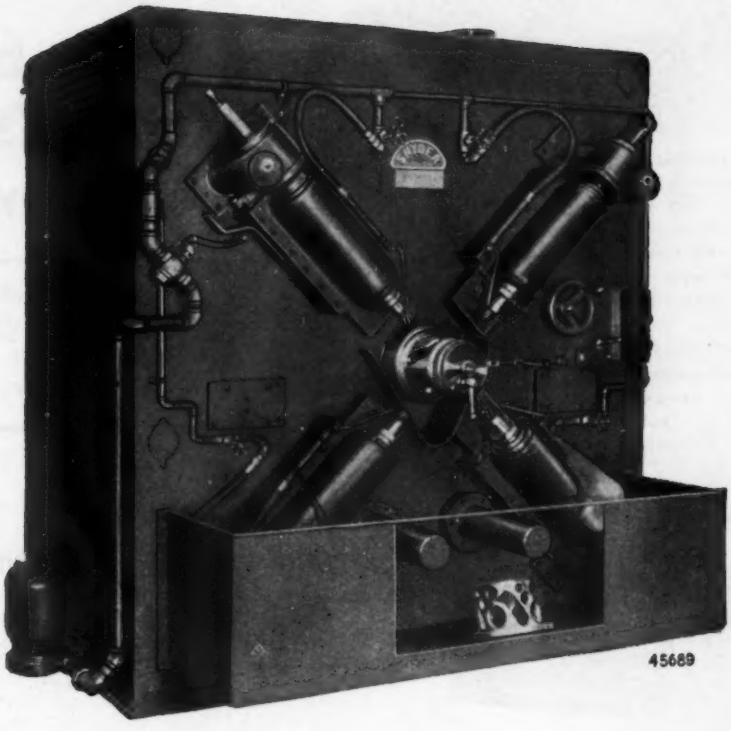

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Developed for finish (or rough) milling four cam slots in each cam, the machine is equipped with four spindles to mill all four slots at one time. Spindles are mechanically inter-connected (each has its own hydraulic cylinder) and go through rapid approach and feed into the work in small steps while the work piece reciprocates and rotates in conformity to the master cam. For smooth cam-follower operation, the master cam is designed with a rise-to-length ratio of one in five. Cam movement is integrated with the motion of the fixture.

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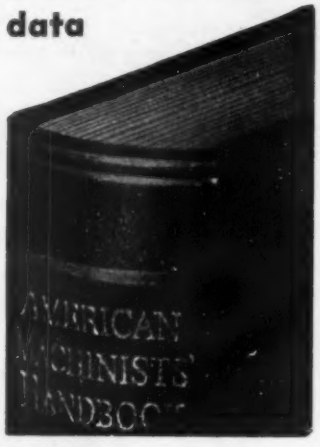

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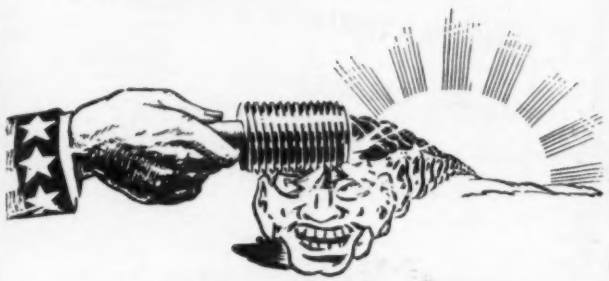

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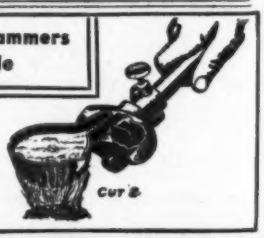

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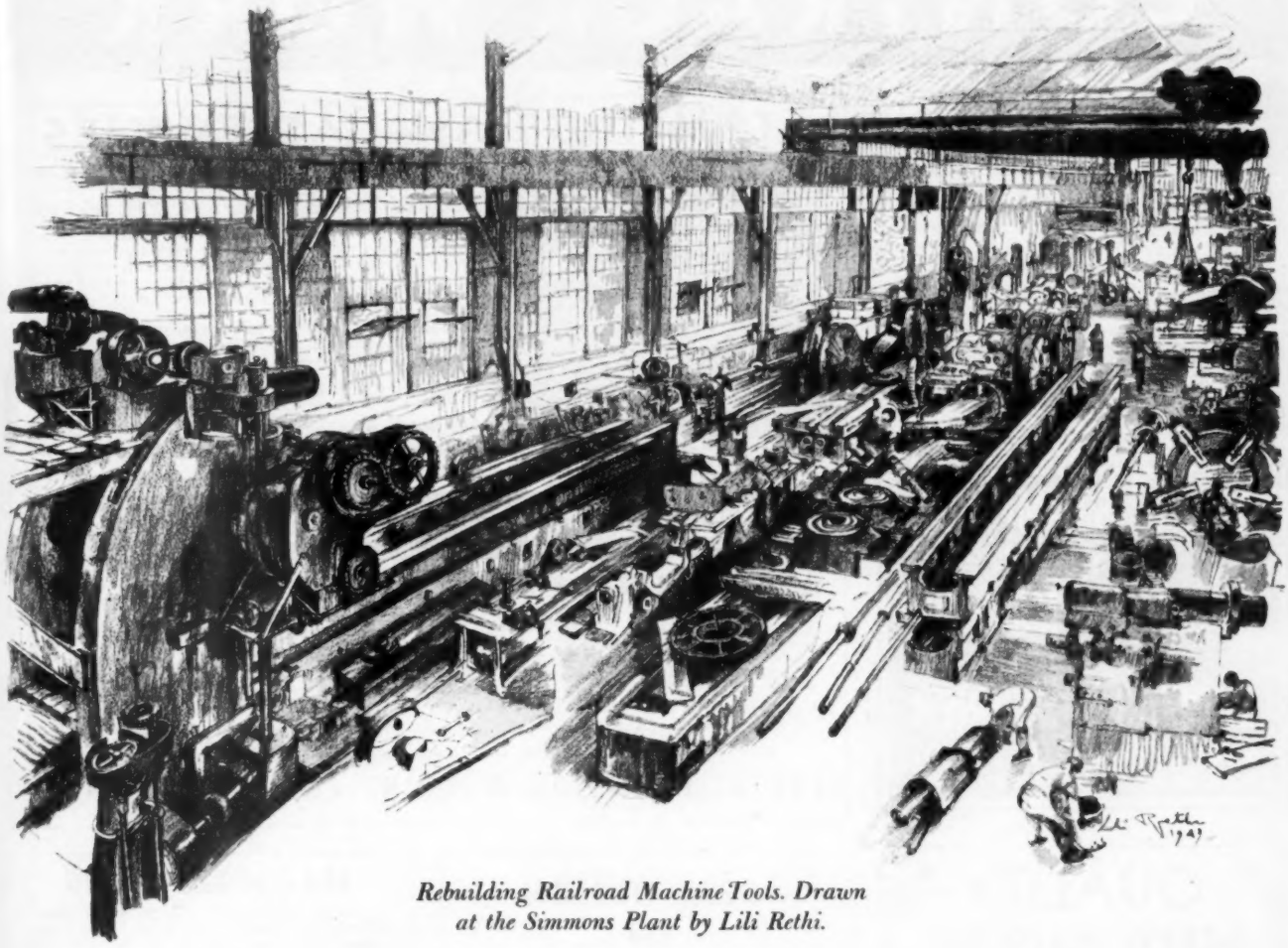

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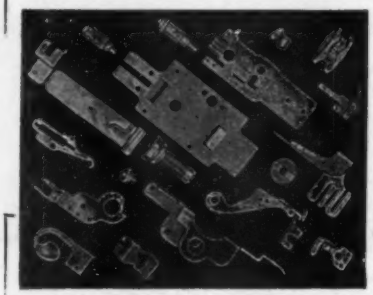

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SMALL TOOL SALES AGENT or agency wanted to handle adjustable limit snap gages. Liberal commission, and exclusive territory. Refer to American Machinist, SW-683, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVES AVAILABLE

ADDITIONAL LINES wanted by well established Manufacturers' Agent with fifteen years successful experience and extensive and valuable list of customers and their mechanical men and buyers. Exclusive sale of light machinery and tools of exceptional merit desired. Territory covered by our practical Tool Service men, Southern Michigan and Northwestern Ohio. American Machinist, RA-692, 520 No. Michigan Ave., Chicago 11, Ill.

MANUFACTURER of Carboloy tipped tools requires Sales Representatives for all states. Can offer best deliveries flat and dovetail form tools, counterbores, reamers, etc. Give full particulars, in first reply. Confidential. American Machinist, RA-707, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

WANTED

WANTED—Lempco-Norton or Landis Crankshaft Grinder in A1-shape. American Machinist, W-710, 68 Post Street, San Francisco 4, Cal.

WANTED, Libert High Speed Shear, ‡1036 or ‡1060. Give description and price. Richardson, Cawker City, Kansas.

CONTRACT WORK

WORK WANTED—For advertisements of work wanted see page 268.

WANTED

SALES ENGINEER

Well established Chicago firm now selling principally to War Contractors wants man to sell new and reconditioned machinery. Excellent post-war possibilities. Prefer man experienced in use of Metal Fabricating Machinery and Machine Tools.

SW-709, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

FOR SALE

BLACKSMITH AND MACHINE SHOP

Fully equipped, block and part frame building in good condition, 3300 sq. ft., 1000 sq. ft. upstairs. Enough work for 5 men the year round. Also dwelling property and 3 lots.

HOCHSTETLER BROTHERS
Mt. Hope, Ohio

WANTED ADVERTISING — SEE PAGE 277

IN STOCK!!!

LATHES

Putnam 26" x 12' Heavy Duty Screw Cutting Engine Lathe, QCG.
LeBlond 21 x 10 Quick Change Gear Lathe, motorized.
Reed 22" x 16' Plain Change Lathe, Light Pattern.
Rockford 14 x 6 Quick Change Gear, motorized.
Champion 18" x 12' Quick Change Gear Lathe.
Superior 18" x 8' Heavy Duty Quick Change Gear.
LeBlond 14" x 6' Toolroom Quick Change Gear Screw Cutting Lathe, with taper attachment, draw-bar collets and two chucks.
Hahn-Mayer 18" x 10' bed Standard Change Gear Screw Cutting Engine Lathe Price: $850.00.
Hendey 14" swing x 5' bed Quick Change Gear Cone Dr.

TURRET LATHES

Jones & Lamson 3 x 36 Chucking Machine, Serial #15,451, single pulley drive.
Jones & Lamson 3 x 36 Chucking Machine, Serial #15,347.
Warner & Swasey 1¼" capacity Hand Screw Machine, 6-hole round turret with automatic bar feed, with collets and cross slide, arranged motor drive with Turner Uni-drive and motor. Price $850.00.

FURNACE

1—W. S. Rockwell Revolving Annealing Furnace, Model 701.

HAMMERS

1—1100# Bement & Miles Steam Forging Hammer.
No. 6¼ Rochester, High Speed Riveting Hammer.
No. 5½ B Rochester High Speed Riveting Hammer.
High Speed Riveting Hammers—4A, 3A, HD, 2A, HD, 1AA.
50# Fairbanks Blacksmith Power Hammer.

BORING MILLS

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

LOCOMOTIVE CRANE

Ohio Locomotive Crane, 22½ tons, 8 wheel, 50' boom, ASME boiler, 150# pressure.
PRICE: $9000.00.

GRINDERS

No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
Gorton, double end Disc Grinder, 18 discs.
Greenfield Internal Grinder #12 Hydraulic, motor drive, capacity 15" swing, grinds automatically ¾ to 5" diameter, 4" deep, equal to new.
36" Blanchard #16 Vertical Rotary Surface Grinder, late model.
Heald 16" Rotary Surface Grinder #255, motorized.
Pratt & Whitney Vertical Surface Grinder 14" x 36", Model B, ball bearing, motor drive.
#2 Brown & Sharpe Universal Cylindrical, belt drive.

BX CABLE COILING MACHINES

No. 1 and No. 2 Sleeper & Hartley BX cable coil, mach., ⅜ and ½ in. cap. Last used for speedometer cable. Complete.

DRILLS

Leland-Gifford 2-spindle, No. 2 M.T., high speed, ball bearing Drill Press, power feed.
Allen single-spindle, high speed, ball bearing, 8" overhang Drill Press, table 14 x 14.
Avey single-spindle, No. 2 M.T. Toolmakers Drill Press, two tables, like new.
Henry & Wright 6 spdle #2 M.T. High Speed, B.B.
RADIAL DRILL—Bickford 7' arm, 15" round column, gear box motor drive.
Radial Drill—Cincinnati-Bickford, 4" arm, 11" column, gear box motor drive.
Prentice 4-spindle No. 2 M.T. High speed Ball Bearing Drill, rebuilt.

DRILLING MACHINES

Fox No. 15 H Multiple Spindle Drilling Machine, hydraulic feed, drilled for 54 spindles and equipped with 32 No. 1 Morse taper spindles, 43" x 23" rectangular head. Serial No. 1065, motor driven, 10 H.P., 3 phase, 60 cycle, 440 volts.
Fox No. D31 mult. spindle drill, mach. Drilled for 32 spindles and equip. with 16 No. 2 Morse taper Pwr. fd., 17" x 34" bd. Ser. No. 626, m.d. 10 H.P., 3 ph., 60 cy., 220 v.
Natco No. 12 mult. spindle drill, mach. Single pulley, B.D., Drilled for 16 Spindles and equip. with 6 No. 2 Morse taper. Power feed.
Avey 4-spindle No. 3 M.T. Power Feed to each spindle, High Speed, Ball Bearing, Sliding Head, 24" swing Drill Press, with screw elevating table, working surface 20 x 63, motor driven by 5 H.P., 3 phase, 60 cycle, 440/220 volt motor and push button control, complete with oil pump and piping. In perfect condition. Bargain!

GEAR SHAPERS

2—#612 Fellows—Late type.
1—No. 3 Brown & Sharpe Spur Gear Cutter.
1—No. 13 Brown & Sharpe Spur & Bevel Gear Cutter.

SHAPERS

26" Cincinnati Triple Geared Shaper, Friction Drive.
20" x 20" x 36" N-B-P Shaper-Planer, Arranged Motor Drive.
16" Cincinnati Back Geared, cone drive.

COIL STRAIGHTENERS

No. 5-18½ Litteil Single Rack & Pinion Feeding and Straightening Machine takes stock 18½" wide up to 10 gauge.

MILLING MACHINES

Cincinnati #3 Vertical Milling Machine, High Power, Power Rapid Traverse, Motor Drive.
Ohio No. 34 Heavy Universal Milling Machine, M.D.
No. 1½ Valley City Plain Miller, belt drive.
PRATT & WHITNEY 2" Splin- Duplex Miller.
1—No. 3 Cincinnati Plain Miller, single pulley drive, high power. Serial #A-889-H.
1—No. 4 Cincinnati Plain Miller, single pulley drive, high power. Serial #4-335-K.
1—No. 4 Cincinnati Plain Miller, high power. Serial #A-703-D.
1—No. 5 Cincinnati Plain Miller, high power. Serial #4-525-N.
1—No. 5 Cincinnati Plain Miller, high power. Serial #A-603-A.

Presses, Brakes and Shears

Niagara #208 Circle Shear and Flanger.
Guillotine Bar Shear—Pels 2½" cap.
No. 132 Bliss 14 ga. 18" throat slitter.
No. 232 Bliss 12 ga. 18" throat slitter.
100 ton Adriance Straight Side, Single Crank, Single Acting. Back Geared Power Press, 2" stroke, 18 x 18 bed area.
#21 Bliss O.B.I. Press, 2½ stroke.
#21 Bliss O.B.I. Press, 2" stroke.
#216 Consolidated Double Acting, Cam Drawing Press, straight side, tie rod, 5" stroke.
Truesdale #19, similar Bliss #19.
Baxendale No. 4 and No. 3, comparable Bliss #20 and #19 O.B.I.
Manville #4 Perforating Press with roll feeds.
Bliss #2 Back Flywheel 1¼" stroke (8).
Niagara #35 Arch Press, 2¼" stroke.
Bliss #30 Arch Press, 2¼" stroke.
Rockford #3 O.B.I. Press, weight 1800#, 2" stroke.
Newbold Double Eccentric Back Geared Press, bed 48 x 20, 3½" stroke, shut 7¾", tons pressure capacity 200 tons, arranged motor drive with 10 H.P. motor 3-60-440 volt.

BENDING ROLLS

8' ⅝ cap. Pyramid Type Drop End Housing, Geared motor drive, 3 phase, 60 cycle, 440 volt.

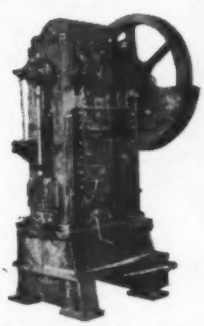
WELDER

1—Federal Type C Gun Welder, 50 KVA, complete with square D timer; cable, etc. 60 cycle, 220 volt service. Purchased new 1941; Never used. PRICE: $1165.00 f.o.b. Rochester, New York.

15—6-SPINDLE AUTOMATICS—LIKE NEW

New Britain #61—1⅝" 6-spindle Automatics—3 equipped for bar work—12 equipped for second operation work. Machines are about 15 months old. Now available for immediate delivery. Equipment includes motors, chucks, collets, and tooling. Write, wire or phone Main 6347.

Consolidated 216 Double Action 100 Ton Press



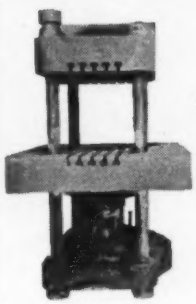
Consolidated No. 216 Double Acting, Cam Reducing Press, Straight Side, Tie Rod Construction, Plain Flywheel. Bolster area 28 x 26. Equipped with coil straightening rolls, roll feed, scrap cutter, stroke of plunger 5". Condition guaranteed first class. F.O.B. Rochester, New York. Available for immediate delivery.

PLANERS

POND 72" x 72" x 18' table; 2 heads on rail, 2 side heads.
CINCINNATI 30" x 30" x 10' table, M.D.
PUTNAM 48" x 48" x 12' table, M.D.

PROFILERS

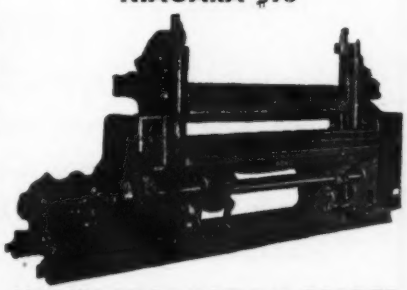
P. & W. No. 12 2-spindle motorized Profiler, Table 12" x 15" equip. with 6" rais. blocks, and 5 H.P., 3 ph. 60 cycle, 220 V. motor—Turner drive mounted and wired to push button control—rebuilt and guaranteed.



200 TON HYDRAULIC PRESS

American Car & Foundry upmoving ram; 4-column type; distance between columns 35" right to left, 24" front to back; daylight 34½"; minimum die space 22"; platens are made with 5 tee slots; bottom platen area 49" right to left, 36" front to back; cylinder 13⅛" diameter; 24" stroke; 2500# pressure capacity.

NIAGARA #98



HEAVY PRODUCTION FOLDER

6' x 14 gauge capacity. Ar. M.D.
Working length 72", cap. 14 gauge: min. width of fold at cap. 1" gaging range (narrow folds) 3/16" to 1⅝", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

Buy From Stock

FALK MACHINERY MERCHANTS

MACHINERY MERCHANTS

18 WARD ST.

Tel. Main 6347

FALK MACHINERY CO.,

ROCHESTER 5, N.Y.

EASTERN OFFERS FROM STOCK

GRINDERS

Cincinnati Valve Seat Grinder, m.d., cap. ⅝" valve stems
No. 55, 60, 65 Heald Cylinder Grinders
No. 20 Gardner Comb. Disc Grinder and Roller Sander, m.d.
No. 6 Bryant Internal
No. 10 Bryant Internal
No. 20 Bryant Internal
No. 72 Heald Hydraulic Internal, with attachment for grinding tapers in spindles, 3 motor drive
No. 1 Fraser Lapper, 26" plate
No. 3 Abrasive, with mag. chuck
14" Pratt & Whitney Vertical Surface, m.d., with mag. chuck.
38" x 38" x 12' Gray Planer Type Surface, m.d.
54" Bridgeport Knife, belt
3" Sellers Drill, belt
Landis Chaser Grinder, belt
Glisholt Universal Tool, belt
Gleason Cutter, belt
Gould & Eberhardt Gear Cutter Grinder, belt

CYLINDRICAL GRINDERS

8 x 36" Cincinnati Saddle Type, m.d.
10 x 36" Landis Integral Cam, m.d.
10 x 52" Landis Plain, m.d.
10 x 72" Landis Plain, m.d.
12 x 36" Cincinnati Plain, belt
12 x 36" Modern, m.d.
12 x 36" Modern, belt
12 x 42" Landis Plain, belt
12 x 48" Cincinnati Plain, 3 motor drive
12 x 48" Modern Plain, m.d.
16 x 120" Landis Plain, m.d.
26 x 96" Landis Plain, m.d.
16 x 40" Landis Universal, m.d.
16 x 72" Landis Universal, 3 motor drive

EMERY GRINDERS

1 H.P. Production, m.d.
3 H.P. U.S., m.d.
5 H.P. Northern, m.d.
Keller Portable Flexible Shaft Grinder, m.d.
1½, 2, and 3 H.P. NEW Baldor Emery Grinders
No. 6 Blount, belt
Bridgeport, belt
Diamond, belt
Mitchell Eng. Type A1 Polishing Stand, m.d. in base
Mummert & Dixon No. 516 Radial, m.d.
5 H.P. Northern, d.c. motor
Rockford Wet Emery, belt
Strand type M7 1 H.P. Flexible Shaft

HAMMERS

50 lb. Little Giant, m.d.
No. 400 Bliss Board Drop, belt
600 lb. Niles-Bement-Pond Steam
800 lb. Bement Steam
1100 lb. Bement Miles Steam
Pettengell Bumping, belt

KEYSEATERS

No. 2 Morton, belt
No. 2 Baker, belt
No. 4 Mitts & Merrill, belt
30" stroke Morton

ENGINE LATHES

14" x 8' Sidney
16" x 6' Hendey Yoke Head
16" x 8' Reed-Prentice, taper
18" x 8' Reed-Prentice Geared Head
18" x 10' Lodge & Barker
18" x 10' McFarland & Nottingham
20" x 8' Hendey Yoke Head
20" x 10' Hendey Yoke Head
20" x 10' LeBlond
24" x 12' Monarch Geared Head, m.d.
22" x 16' centers (22' bed) American 100 H.P. Input Super Lathe, variable speed m.d. with 100 H.P. motor
22" x 18' Niles
24" x 10' Greaves-Klusman, taper
24" x 10' American Geared Head
24" x 15' Prentice Geared Head
25" x 14' LeBlond
27" x 16' LeBlond, taper
30" x 14' Lodge & Shipley, m.d.
36" x 10' Putnam
36" x 16' Springfield

Send us your inquiries. 1,000 machines in stock.

The
EASTERN
MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

Have you any Heald No. 70 or 75 Internal Grinders? Let BRADLEY modernize your internal grinders.

Have your Heald No. 70 or 75 look like this and operate like new

We build a new hydraulic internal but will be glad to take your old Heald No. 70 or 75 and give you a machine equal to new—equipped with brand new head, Timken Zero Bearings, Parker or Ex-Cell-O Wheel spindle. Modernized and motorized; Made hydraulic if required.

Write, wire or call for details

BRADLEY MACHINERY CO.

211 Jos. Campau. Fl. 6375 Detroit, 7, Mich.

HILL-CLARKE

Modernized

CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

SIZES AVAILABLE

10x28	10x50	14x72	16x72
10x36	14x50	16x50	18x96

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD — CHICAGO 6, ILL.

60 MODERN MOTOR DRIVE AND SINGLE PULLEY DRIVE MACHINE TOOLS

THE FINEST LOT RELEASED IN YEARS JUST TAKEN OUT OF OPERATION

Immediate Delivery — ***No Priorities Required***

MILLERS

1—Cincinnati #2 Plain
1—Cincinnati #3 Plain
3—Cincinnati #3S Plain
1—Cincinnati #4 Plain
1—Cincinnati #3 Vertical
3—Cincinnati #4 Vertical
1—Brown & Sharpe #5B Heavy Plain
2—Brown & Sharpe #3 Verticals
1—American #2 Plain — new 1942
1—Rowbottom Universal Cam Miller
2—Pratt & Whitney 6" x 48" Thread Millers
1—Pratt 2" Duplex Spline Miller

RADIAL DRILLS

1—4' Cincinnati-Bickford
2—5' Cincinnati-Bickford
4—6' Cincinnati-Bickford

GRINDERS

3—Heald #70-A Internal — MD.
1—Abrasive #5 Surface with chuck
1—Norton 10" x 36" Plain Cylindrical
1—Norton 10" x 50" Plain Cylindrical
1—Norton 18" x 96" Plain Cylindrical
1—Brown & Sharpe #4 Universal

GEAR MACHINERY

1—Gould & Eberhardt #18H Hobber
2—Gould & Eberhardt #36H Hobbers
2—Fellows #6 Spur Gear Cutters

LATHES

4—Lodge & Shipley 20" x 8'
1—Lodge & Shipley 18" x 8'

PLANERS

2—24" x 24" x 6' Chandler
1—24" x 24" x 6' Gray
1—30" x 30" x 10' Cincinnati 4 Head
3—36" x 36" x 20' Cincinnati 2 Head

MISCELLANEOUS

1—Porter-McLeod 8" Cold Saw — 1 year old
1—Avery 3 Spindle #2 MT Drill
1—Fox #3 Multiple Spindle Drill — 14 Spindles
1—Cleveland ⅝" Model A Automatic
1—Oliver #51 Drill Grinder

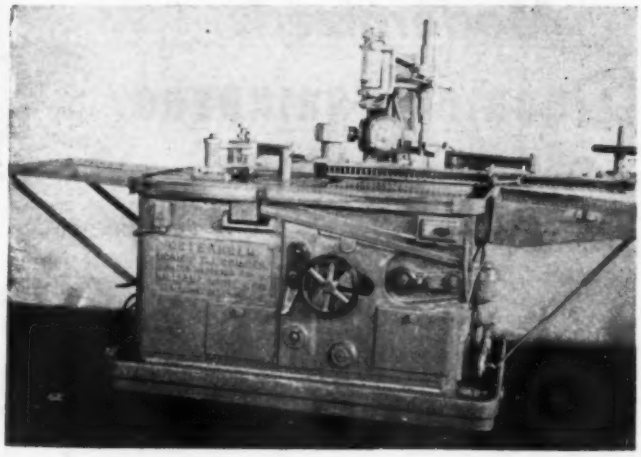
WRITE, WIRE or PHONE

BOTWINIK BROS., INC. — 383 Welton St. — New Haven 9, Conn.

PRODUCTION SURFACE GRINDER

OSTERHOLM HORIZONTAL SURFACE GRINDER

Table 25" x 45". Wheel 20" dia. Grinding wheel is mounted on vertical spindle which is arranged for a vertical adjustment. With motor driven feed for pushing work across table. Equipped with motor, starter and coolant pump.



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IMMEDIATE DELIVERY

LOUIS E. EMERMAN & CO.

Machinery

875 W. 120TH STREET — CHICAGO 43, ILLINOIS

LATHES

36 x 30' LeBlond Geared Head M.D. Q.C.
26" x 10' Niles, Cone, Q.C.
26" x 12' Putnam Heavy Duty 3 step.
24" x 10' American Geared Head Lathe.
14" x 10' Sebastian Geared Head.
14" x 6' American Lathe, 4 step cone, Q.C.

GRINDERS

Fitchburg Spline Shaft Grinder.
Lees Bradner Gear Grinder.
Simplicity Piston Grinder.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#645 Fellows Gear Shaper, Cullman, M.D.

PLANERS

72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodward & Powell, 2 Hds.

RADIAL DRILLS

2½' American Plain, M.D.
3' American Sensitive.
3' American Plain.
3' Cincinnati Bickford Plain Radial Drill.
4' Cariton Plain Radial Drill.
6' American Triple Purpose Plain Radial.

MISCELLANEOUS

12 Ga. 30" Throat Quickwork Shear, M.D.
14" Niles Slotter.
1500# Bell Steam Hammer.
#4 Cincinnati Vert. High Power Mill, M.D.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second Street, Cincinnati, Ohio

REBUILT PLANERS AND LATHES

AVAILABLE FOR IMMEDIATE INSPECTION AND DELIVERY

1—48"x36"x18' Detrick & Harvey Openside Planer
2—42"x42"x12' Pond Heavy Duty Double Housing Planers
1—36"x36"x12' Betts Heavy Duty Double Housing Planer
1—36"x36"x10' Gray Heavy Duty Double Housing Planer
1—24"x24"x 6' Gray Double Housing Planer
1—24"x12' Putnam Engine Lathe
1—20"x10' Flather Engine Lathe
1—20"x 6' Flather Engine Lathe
1—18"x 6' Monarch Engine Lathe

ATLANTIC MACHINERY CORPORATION
149 BROADWAY — NEW YORK, N. Y. — WOrth 2-0662

UNUSUAL VALUES

Belt Cutter 1" capacity, 3 spindle
Brake Robinson 5' toggle
Compressor, 120 Schramm, portable
Drill, new 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Press, 20" three spindle Barnes
Drill, six-spindle Henry & Wright, 12" overhang
Drill, two spindle sensitive, #1 Morse taper
Grinder #20 Bryant deep hole internal
Grinder 60" plate
Grinder, Sellers Tool
Lathe, 14"x12' Lodge-Shipley grd. bd. s.s. mtr. dr.
Lathe, 24" x 18' Steptoe-McFarlan
Motors—new ⅓ to 30 HP-3 phase ball bearing
Pipe Machine, 6" Merrell
Press #8-7 Zah-Hahnemann straight side grd.
Punch & Shear ⅝" capacity Rock River
Punch & Shear, two ½" capacity
Threading Machine #6 Webster & Perks
Turret Lathe L & D brass, cross slide turret
Vacuum Cleaners, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

MISCELLANEOUS MACHINES

12 x 18" Cincl. Plunge Cut Grinder, m.d. with 9" face wheel, rebuilt.
3' Carlton Sensi. Radial with tapping att.
3' 9" col. American Enclosed Head Plain Radial Drill
4' Hammond Sensi. Radial, with tapper, m.d.
6' Niles Plain Radial Drill, m.d., rebuilt
2-spindle DEMCO High Speed, B.B. Drill, hand feed, ¾" cap.
Gisholt Tool Grinder, arr. for m.d.
Oliver Tap Grinder, m.d.
12" Double End Warner & Swasey Key Lathe

STRONG, CARLISLE & HAMMOND CO.
1392 West 3d St. Cleveland, Ohio — 2832 East Grand Blvd. Detroit, Mich.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

NEW HAVEN 38" x 22' Heavy Duty, Triple Geared, Internal Geared Faceplate Drive ENGINE LATHE, A.C. Motor Drive.
NILES-BEMENT-POND Horizontal Boring, Drilling & Milling Machine, 4½" bar, Duplex Control, Table Type, with Auxiliary Table, M.D.

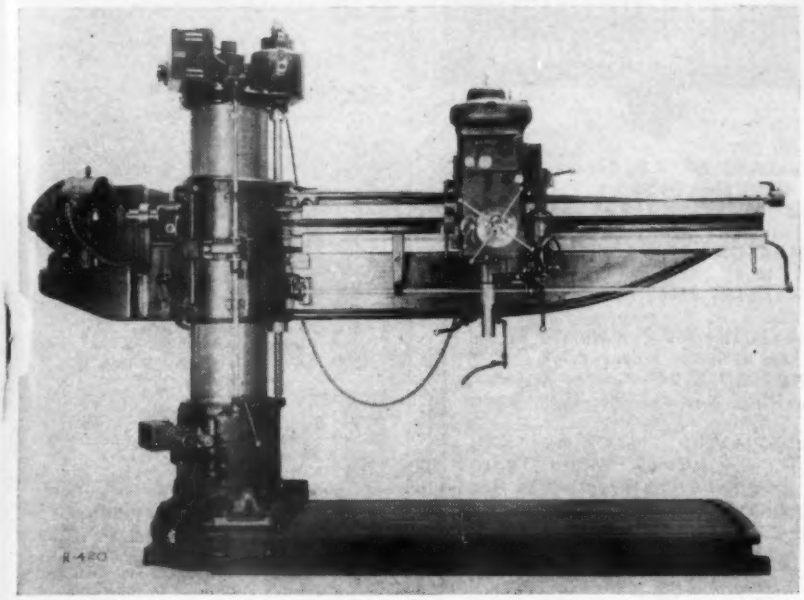
ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2269 Woolworth Building — New York, N. Y.

Before you buy, sell or exchange machinery of any kind contact us first.

PAUL'S MOTOR & MACHINERY SUPPLY
6111 Vermont Ave.
DETROIT, MICH.

12 foot-26 inch column Diameter . . .



AMERICAN TRIPLE PURPOSE RADIAL DRILL

In practically new condition — built in 1941 — arranged for variable speed motor drive on arm, has oil grooved base, fully inclosed head. Weight 58,500 lbs.

On our floor, ready for immediate shipment.

THE EASTERN MACHINERY CO.

1004 Tennessee Ave. **Cincinnati, Ohio**

QUALITY TOOLS IN STOCK

Automatic, 1⅝" No. 55 National Acme M.D.
Automatic, No. 16 Gisholt Simplimatics
Chuckers, 4½" Gridley Model H, 4 spindle
Chuckers, 7" Baird 6 spindle
Cylinder borer, 3⅞" bar Beaman & Smith, horizontal
Boring Mill, 3" bar Universal, No. 3A
Boring Mill, 42" Bullard vertical
Brake, 10' Ohl 8" crank, 255 ton cap'y press brake
Broaches, Nos. 3 & 4 J. N. LaPointe
Compressor, 550 cu. ft. National 3 cylinder vertical
Compressor, 1400 cu. ft. Sullivan WN3
Drill, 30" Rich Tool Co., heavy duty
Drill, 20" Barnes A.G.S.O.
Drill, No. 16 Nateo multi, 24 spdl.
Drill, Type 8H Nateo horizontal
Drill, W. F. & J. Barnes vertical boring, reaming & drilling, hyd. feed
Drill, Rehnberg-Jacobsen, 16 spdl. production
Gear Cutter, 66", No. 5A Cincinnati spur
Gear shaper, ZI (No. 61) Fellows
Gear Hobber, No. 1 Lees Bradner Mfg.
Gear hobber, No. 16 HS Gould & Eberhardt
Grinder, No. 3 Cincinnati universal
Grinder, No. 84 Gardner, 24" opposed spindle
Grinder, Landis 10" x 48", 12" x 36", 16" x 52"
Grinder, Landis 16" x 32" & 16" x 48" crankpin
Grinder, internal, No. 72 Heald electric indicator
Grinder, 20" x 50" Safety Emery Wheel surface
Hammer, 100 lb. Bradley helve
Lathe, turret, 26" Libby, 4½" hole
Lathe, turret, 2½", No. 9 Bardons & Oliver
Lathe, turret, No. 4L Gisholt, 9¼" hole
Lathe, 36" x 16' Putnam heavy geared Bod.
Lathe, 4" x 36" Lo Swing, hardened ways
Lathe, 8" Sundstrand Stub
Lathe, 14" x 19" Fay automatic
Miller, Type C Hall Planetary thread
Miller, No. 3 Turn Millers
Miller, No. 3H Leblond heavy duty universal
Miller, Nos. 10 & 45, Productomatic
Miller, 30" Newton cont. rotary
Planer, 24" x 24" x 6' Woodward & Powell
Press, No. 8-7 Zeh & Hahnemann str. side
Press, No. 33 Toledo arch
Press, No. 174 Consolidated Dbl. Cr., roll feed
Presses, Nos. 180 & 796¼ D Toledo, toggle drawing
Presses, Nos. 201 & 203 General Flexible
Punch, ¾" x ¾" x 26" throat Rock River
Riveters, Nos. 2A hy., 5½ B & 7B High Speed
Rolls, No. 1A Ajax taper forging
Rolls, No. R60 Yoder fender crown
Roll, Waterbury Farrel thread roller
Saw, 36" Newton cold
Saws, Nos. 12, 14 & 17 Higley cold 4" to 8"
Shaper, 16" Milwaukee
Shaper, 36" Morton draw-cut
Shaper Planer, 26" Lynd Farquhar openside
Shears, 8" x 8" x 1" Long & Allstatter angle
Slotter, 4" Garvin
Swager, No. 6 HS Langelier
Tapper, No. 2X Garvin
Threader, ¾" Economy automatic stud
Threader, 2" Landis bolt 2 spdl.
Upsetter, 4" Ajax
Welder, 150 KVA Swift, flash or butt
Welder, 375 KVA Fisher Body projection

MISCELLANEOUS

Casing coiler, ¾" No. 319 Sleeper & Hartley
Spring coiler, No. 5, ⅝" capy. Sleeper & Hartley
Hone, No. 211 Barnes
Lathe, Melling 6 cyl. crankshaft
Sand Mixer, Baker Perkins
Screw Driver, No. 61AA Bodine
Washer, Blakeslee metal
Threader, 1" Cleveland automatic double end
Gear checker, National Tool, for gears & cutters
Grinder, Cincinnati face milling cutter
Buffer, Hawes No. 575 for polishing
Die Casting Machine, A. C. Spark
Screw driver, Model C Detroit
Washer, Blakeslee, conveyor type

If you do not find the machine you need listed herein, mail us your inquiry and specifications. We may have or know of that very machine

Ask for Your Copy of Stock List No. 176

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ST. LOUIS' Headquarters For Good Used Tools, Offers:

ROCKFORD 24" S.P.D. Shaper
BAUSH 44" M.D. Vert. Boring Mill
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CIN. 36" x 36" x 10' 2-H.D.S. Planer
NATCO 4-SP. Hyd. Horiz. Drill
GISHOLT 30" Vert. Turret Lathe
CIN. 48" Pl. Auto. Miller M.D.
NILES 12" Vert. Slotter
INGERSOLL 2-Sp. Vert. Miller
G & E 72" Auto. Gear Cutter
DIAMOND M. D. Horiz. Surf. Grinder
GOULD & EBERHART Rotary Milling Mach.
BIGNALL-KEELER 12" M.D. Pipe Machine
MADISON-KIPP Die Casting Mach.
SMALLEY GENERAL #23-A Thread Miller
BRADFORD 22" x 18' Grd. H.D. Lathe
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Landis 14 x 52", S.P.D.
Modern 12 x 48", M.D.
B. & S. No. 10, 11, 14
P. & W. 14", 18", B.B.
Hanchett 10' Face, M.D.
50" x 28', Norton Roll
Blanchard 30", M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N. Y.

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received by November 25th will appear in December 9th issue, subject to space limitations.

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Landis 20" x 136" Universal Grinder, M.D.
2¼" J & L arranged for bar
2¼" J & L arranged for chucking

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N. Y.

5' Radial Drill, Bickford, M.D.
26" x 14' Bridgeford Geared Head Lathe.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
50" G & E Gear Cutter.
24" Gisholt Turret Lathe, 6¼".
20"-24"-32" Shapers.
10' Bridgeport Knife Grinder.
36" Morton Draw Cut Shaper.
No. 2 Mitts & Merrill Keyseater 12" x 1¼".

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

. . . IN STOCK

AUTOMATICS
No. 00G Brown & Sharpe, single spindle
No. 00 Brown & Sharpe, single spindle
⅞" Model M Cleveland, four spindle
1¾" Gridley Model F, four spindle
9/16" National Acme, No. 515, four spindle
4½" Cleveland, Model A, single spindle
5½" Cleveland, Model A, single spindle

BROACHES
HO American Hydraulic, Horizontal
XB10 Oilgear Hydraulic, Horizontal

DRILLS
24" Colburn, single spindle
Barnes Camelback, single spindle, tapping
No. 17 Foote-Burt, 2 spindle
Avey Sensitive, 3 spindle
Leland-Gifford, Sensitive, P.F., 3 spindle
Barnes Camelback, 4 spindle, 2 tapping
No. 11 Natco, multiple spindle

GEAR CUTTERS
No. 12 Barber Colman
No. 6 Fellows Gear Shaper
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS
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No. 16 Blanchard 26" chuck
22" x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
10" x 72" Brown & Sharpe Cylindrical
6" x 32' Norton Cylindrical
No. 1 Cincinnati Tool & Cutter
No. 70 Heald Internal

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18" x 8' Sebastian, g.h.
14" x 6' Lodge & Shipley, c.d.
36" x 20' Boye & Emmes, g.h.
20" x 14' Hendey, c.d., yoke head
8" x 60" Fitchburg Lo-Swing, g.h.

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24" Bullard New Era Vertical, m.d.
36" Bullard New Era Vertical, m.d.
12" Bullard Mult-Au-Matic, six spindle, m.d.
No. 4 Warner & Swasey Universal, g.h.
No. 2A Warner & Swasey, g.h.
18" Libby Universal, g.h.
21" Gisholt Universal, c.d.
26" Libby Universal, g.h.

MILLS
No. 2 Kempsmith Universal, c.d.
No. 9 Ryerson-Conradson Plain, s.p.d.
No. 12 Brown & Sharpe, c.d.
No. 6 Whitney Hand. c.d.
No. 3 Knight Vertical, s.p.d.
No. 2 Kempsmith Vertical Maximiller, m.d.
No. 3 Brown & Sharpe Vertical, s.p.d.
Model C Becker Vertical, s.p.d.
4" Pratt & Whitney Spline

MISCELLANEOUS
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Cochrane-Bly Die Filing Machine
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Pratt & Whitney Design Profiler
No. P2 Ferracute Press
15 Ton Lucas Forcing Press, m.d.

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24" x 24" x 8' American Planer, m.d.
38" x 38" x 12' Niles Planer, m.d.
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GLEASON 10" Spiral Bevel Gear Gen.
GLEASON 3"-6"-18" Bevel Gear Gen.
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SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancer
LONG & ALSTATTER Angle Shears
AMERICAN 30"x30"x14" Planer 2 heads, M.D.
CLEVELAND Model B Auto. Screw Machine—Cap. 1½"
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DIVIDING HEADS
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1—#5 Cincinnati High Power
2—#4 Cincinnati High Power
1—#2 Cincinnati Plain
1—#30H. Sundstrand Rigidmil
8—Production Millers

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1—Diamond Surface 36" x 12" x 14"
1—#4 Brown & Sharpe Universal
1—#2 Brown & Sharpe Surface

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1—42" Baush, 2 swivel heads on rail

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1—5 ft. Cincinnati Bickford
1—6 ft. Niles Universal Arm.
1—4 ft. Cincinnati Bickford
1—5 ft. American Triple Purpose

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1—24" Cincinnati
1—16" Davis Gear Box
1—15" Kelly

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1—#3 Pratt & Whitney Universal 3" Bar Cap.
1—#12 Bardows & Oliver Universal 4" Bar Cap.
1—Foster Screw Machine 1¼" Bar Cap.
1—4½" x 26" Libby-Geared Head Chucking
1—15⅜" x 7" 6 spindle New Britain

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All Sizes.

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11" Gleason Gear Generator with lot of equipment

This is a partial list. Send us your inquiries. What have you to sell? Send us your list.

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GEAR PLANERS, Bevel 36" & 54" Gleason
HAMMERS, Forging 800 lb. & 1100 lb. N-B-P
MILLER, Plain Geared Head 3-B B & S
MILLER, Plain High Power 3-S Cincinnati
MILLER, Universal Geared Head 1-B Milwaukee
MILLER, Vertical Plain 5-C Becker
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TURRET LATHE, 3-A W & S., H.S. 3-11/16"
TURRET LATHE, 26" Libby "C", H.S. 7⅛"
TURRET LATHE, 34" Gisholt, H.S. 4¼"
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STRAIGHTENER, tube Torrington, cap. ¼"-⅝"
STRAIGHTENER, plate H & J 12-roll, cap. 34" x ⅛"

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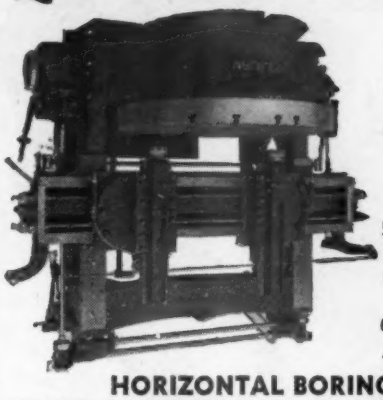

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10 FT. POND, 2 swivel heads on rail, M.D.
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51" BULLARD, 2 heads on rail.
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6" BULLARD MULT-AU-MATIC, 4 stations.

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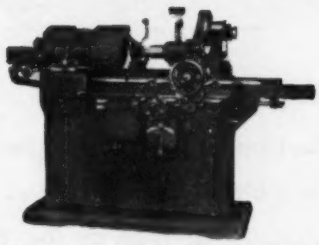

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34"x10'x6" FARREL ROLL GRINDER, 30" grinding wheel, M.D.
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No. 16 BLANCHARD VERTICAL SURFACE, 26" chuck, M.D.
No. 10 BLANCHARD VERTICAL SURFACE, 16" chuck, M.D.
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Walnut 5575

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36" Bullard V.T.L., M.D.
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*(Sizes under 11/16" slightly less)

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U. S. A.

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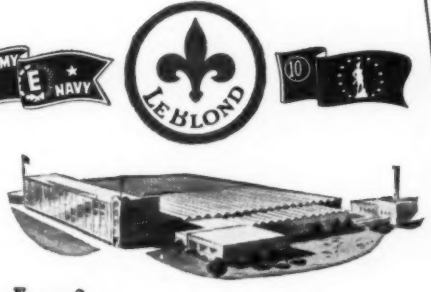

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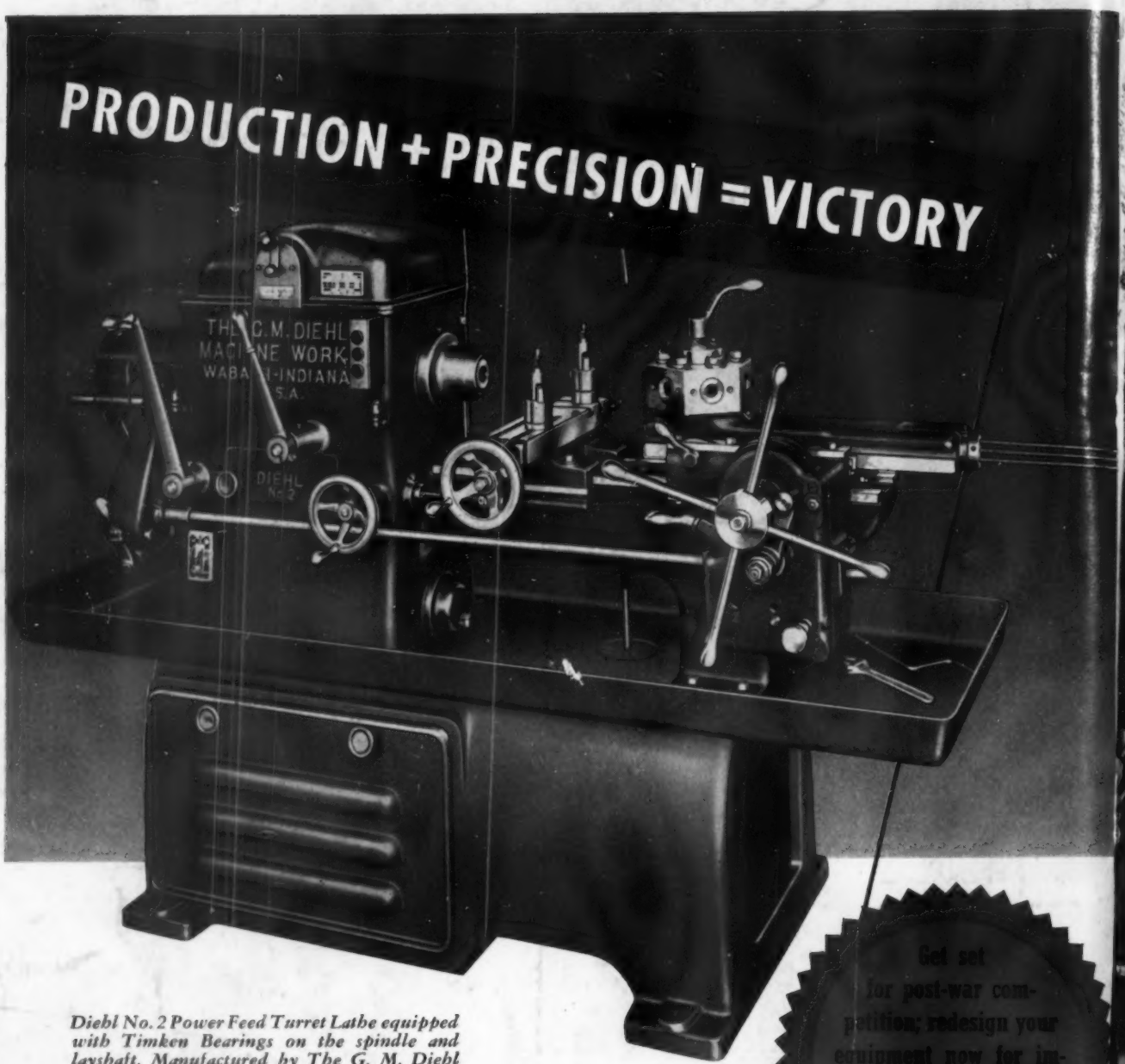

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